Douglas Partners

Geotechnics / Environment / Groundwater

Report on
Additional Geotechnical Investigation

Proposed Pool and Park Redevelopment
Kogarah War Memorial Pool, Carss Park

Prepared for
SJB Architects c/-SJB Planning

Project 99751.01
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Integrated Practical Solutions

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The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

	Signature	Date
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Report on Additional Geotechnical Investigation
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1. Introduction

This report presents the results of an additional geotechnical investigation undertaken for a proposed pool and park redevelopment at Kogarah War Memorial Pool, Carss Park. The investigation was commissioned by SJB Planning on behalf of SJB Architects and Georges River Council and was undertaken in accordance with Douglas Partners' proposal SYD200681.P.001.Rev0 dated 01/07/2020. The investigation was required to support a Development Application for the proposed demolition of Kogarah War Memorial Pool and subsequent redevelopment of the site, including associated remediation.

DP understands that the proposed works will include the demolition of existing structures and the redevelopment of the site into open space grassed areas connecting to the existing playing fields (Carss Park Flats) to the north.

The investigation included the drilling of six large diameter boreholes, eight piezocone penetration tests (CPTUs), three dynamic cone penetrometer (DCP) tests below the base of the pool and laboratory testing of selected samples. A review of existing information from a previous geotechnical investigation conducted by Construction Sciences Pty Ltd was also undertaken.

2. Site Description and Regional Geology

The site is located at the southern end of Carss Park Flats Reserve and is bounded by Carwar Avenue to the west, Carss Point and the Cottage Museum to the south and Kogarah Bay to the east.

The site is an irregular shape which covers an area of approximately 1.2 ha. The site generally slopes to the north east from about RL 7.0 m AHD at the south western end to about RL 2.0 m at the north eastern end towards Kogarah Bay. A low mound of soil covered by vegetation extends along the eastern side of the site in a north-south direction and is about 1.5-2.0 m in height. The central portion of the site is occupied by an Olympic sized swimming pool and associated facilities buildings to the west. Two large (about 8 m diameter) recycled water tanks are situated at the northern end of the existing facilities buildings. The western portion of the site is occupied by an asphalt carpark of about 80 car spaces. The remainder of the site is covered by landscaped areas and concrete walking paths.

The Sydney 1:100 000 Geological Series Sheet indicates that the site is underlain by man-made fill used to raise the natural surface elevation over former estuarine swamps and subaqueous estuarine margins. The estuarine deposits below the man-made fill typically comprise silty to peaty quartz sand, silt and clay.

The regional mapping also indicates that the headland to the south and west of the site is underlain by Hawkesbury Sandstone, which comprises medium to coarse-grained quartz sandstone with minor shale and laminite lenses. It is expected that the estuarine deposits within the site are underlain by Hawkesbury Sandstone at depth.

3. Background and Previous Investigations

In 2016 Cardno (NSW/ACT) Pty Ltd completed a building assets condition assessment of the swimming pool site (Reference 80817051-108-ME-R001, dated 23 Sep 2016). The assessment found that there was significant cracking and structural damage to the pool and facilities buildings due to differential settlement of the foundations. It has since been decided that the site structures cannot be repaired and are to be demolished.

In 2019 Construction Sciences carried out a geotechnical investigation at the site (Reference 5017190024 version 4, dated 12 Nov 2019). The investigation included the drilling of six boreholes (BH01 to BH06) to depths of 3.0-13.5 m using solid flight augers with standard penetration tests undertaken at 1.5 m depth intervals.

The boreholes indicated that the site is underlain by 2.5 m to 4.5 m of fill (sand and clay), over the natural estuarine soil profile. The natural soils were mostly described as interbedded medium dense or denser sands and stiff to hard clays. In the boreholes to the north east of the site (BH02 to BH05) a layer of very loose to loose sand and/or soft to firm clay was encountered directly beneath the fill to a depth of between 5.2 m and 6.0m. Sandstone bedrock was encountered at depths ranging between 2.5 m and 13 m in four boreholes.

4. Field Work Methods

The field work for the additional geotechnical investigation comprised:

- eight piezocone penetration tests (CPT201 to CPT206) taken to depths ranging from 3.4 m to 32.5 m,
- six large diameter boreholes (BH101G to BH106G) drilled to depths of between 0.7 m and 1.7 m in the area of the originally proposed car park to investigate the pavement subgrade, and
- six Dynamic Cone Penetrometer Tests (DCPs) taken to depths of up to 3.6 m or prior refusal at test locations BH103(G) to BH105(G) in the area of the proposed carpark and three extending below the base of the existing pool at BH117 to BH119.

The field work was concurrently carried out with a Detailed Site Investigation (DSI) also undertaken by DP, which included the drilling of 19 shallow boreholes, installation of 5 monitoring wells and the excavation of 11 test pits.

The CPTU testing involves advancing a 35 mm diameter probe into the ground at a constant penetration rate using hydraulic thrust from a truck-mounted testing rig. Instrumentation mounted on the probe continuously measures tip and sleeve resistance as well as pore pressure, and allows the soil type and behaviour to be inferred using established relationships and local knowledge. Where possible, groundwater observations were made immediately after extraction of the probe.

Dissipation tests were undertaken using the piezocone. Each test involved stopping the piezocone at a nominated depth and measuring the rate of pore pressure dissipation to assess the consolidation characteristics of the soils. The data is stored on a portable computer for subsequent interpretation, plotting and analysis.

The boreholes were drilled using an excavator with a 300 mm diameter solid flight auger attachment. Within boreholes BH103(G) to BH105(G) in the area of the proposed carpark, dynamic cone penetrometer tests were completed to depths of between 1.65m and 3.0m. An additional three DCPs were also completed to depth of 3.6 m below the base of the existing pool at the locations of the environmental boreholes BH117 to BH119.

The borehole and test locations are shown on Drawing 1 in Appendix B. The co-ordinates of the test locations were measured using a high precision differential GPS system with an accuracy of +/-0.1 m and are shown on the respective test result sheets and borehole logs in Appendix C.

5. Field Work Results and Interpreted Geotechnical Model

The borehole logs and interpreted soil profiles at each CPTU location are shown on the test result sheets in Appendix C.

Using the CPTU profiles along with current and previous borehole logs, geotechnical cross-sections have been prepared (Sections A-A’ and B-B’) showing the interpreted subsurface profiles between selected test locations. The cross-sections are presented on Drawings 2 and 3 in Appendix B.

The tests encountered the following subsurface conditions across the site comprising:

- PAVEMENT – In the car park areas only - asphaltic concrete 20-60 mm thick over 0.3 m to 0.6 m of apparently well compacted gravelly sand;
- FILL – Mostly gravelly sand, clayey sand, sandy clay and silty clay, generally loose to medium dense or stiff to very stiff with occasional bands of very loose sand or soft to firm clay. The filling also included plastic, rags, glass, metal, concrete and timber fragments. The filling extended to depths ranging from 1.6 m to 6.0 m;
- SAND –Very loose to loose, to depths of about 4.0 m to 6.7 m, encountered only in CPT201, CPT202 and CPT206 to CPT208;
- CLAY – Soft to firm clays, to depths of about 5 m to 6.5 m, encountered only in CPT201 and CPT205 to CPT208;
- CLAY – Stiff to hard clays and silty clays with medium dense and dense sand bands down to the termination depths of all CPTs (5.2 m to 32.5 m) - with the exception of CPT202, CPT203 and CPT204 which terminated within the filling; and
- SANDSTONE BEDROCK – encountered within three of the previous boreholes (BH01, BH02 and BH06), and inferred to be the cause of refusal of BH105(G) and some of the CPTU – depths to sandstone bedrock range from 1.6 m to more than 32.5 m.

The ranges of thicknesses and levels of the top of each layer as measured in the CPTs are presented in Tables 1 and 2.

Table 1: Interpreted Layer Thicknesses

Unit	Layer Thickness (m)							
	CPT 201	CPT 202	CPT 203	CPT 204	CPT 205	CPT 206	CPT 207	CPT 208A
FILL	3.4	3.5	3.4	4.9	5	5.3	4.4	5.4
SAND: Very Loose to Loose	1.0	0.5	-	-	-	0.7 (2)	0.7	-
CLAY: Soft to Firm	0.6	-	-	-	1.5	0.7	1.9	0.7
CLAY: Stiff to Hard with Medium Dense to Dense Sand Layers	10	1.2	-	-	1.8	10.8	25.5	11.5
SANDSTONE BEDROCK (1)	-	-	-	-	-	-	-	-

Notes to Table 1:
(1) CPTU termination depth inferred as top of sandstone bedrock
(2) Very loose to loose sand encountered below soft to frim clay in CPT206

Table 2: Interpreted Layer Levels

Unit	Level of Top of Unit (AHD)							
	CPT 201	CPT 202	CPT 203	CPT 204	CPT 205	CPT 206	CPT 207	CPT 208A
FILL	3.2	3.7	4.7	3.2	3.4	3.5	4.1	3.6
SAND: Very Loose to Loose	-0.2	0.2	-	-	-	-2.5 (2)	-0.3	-
CLAY: Soft to Firm	-1.2	-	-	-	-1.6	-1.8	-1	-1.8
CLAY: Stiff to Hard with Medium Dense to Dense Sand Layers	-1.8	-	-	-	-3.1	-3.2	-2.9	-2.5
Termination Depth (1) (inferred sandstone bedrock)	-11.8	-1.5	-	-	-4.9	-14	-28.4	-14

Notes to Table 2:
(1) CPTU termination depth inferred as top of sandstone bedrock
(2) Very loose to loose sand encountered below soft to firm clay in CPT206

The results of the dissipation tests are provided in Appendix E. A summary of the results is provided in Table 3.

Table 3: Summary of Dissipation Test Results

CPTU ID	Depth (m)	Material	Interpreted Horizontal Coefficient of Consolidation (c_h, m^2/year)
201	3.5	Very loose clayey sand	148
208	4.0	FILL/Clay	0.5
208	5.8	Soft to firm Sandy Clay	15

Measurements of groundwater levels within the monitoring wells installed as a part of the DSI typically ranged between RL 1.2 and RL 1.8 m across the site (that is at about 1.5 m to 2.6 m below existing ground levels). It should be noted that groundwater levels are potentially transient and that fluctuations may occur in response to climatic and seasonal conditions and to a lesser extent due to tidal influence.

6. Laboratory Testing

Laboratory testing was carried out on representative soil samples collected during the field investigation for pavement design. Two soil samples were subjected to four-day soaked California bearing ratio (CBR), standard compaction and field moisture content tests. The results of the geotechnical laboratory testing are summarised in Table 4. The detailed laboratory test reports are given in Appendix F.

Table 4: Summary of Laboratory Test Results

BH ID	Depth (m)	Material	MDD (t/m^3)	OMC (%)	FMC (%)	CBR (%)	Swell (%)
BH103(G)	0.8-1.3	FILL/Clayey Sand	2.03	10.0	7.4	50	0.0
BH105(G)	0.9-1.4	FILL/Sand	1.77	11.5	6.0	45	0.0

Note: MDD = Maximum Dry Density; OMC = Optimum Moisture Content;
FMC = Field Moisture Content, CBR = California Bearing Ratio

7. Comments

7.1 Proposed Re-development

It is understood that the proposed re-development will include the demolition of existing structures including the existing pool shell, remediation of contaminated site soils and the redevelopment into grassed areas to be used in connection with the playing fields (Carss Park Flats) to the north. At this stage it is understood that this will include re-grading of the existing site levels to achieve a 1% fall from approximately RL4.0 m in the south west corner to RL 3.0m in the north eastern corner. It is also understood that the upper 0.5 m of the soil profile across the site will likely be replaced with new imported fill as a part of the remediation strategy.

To achieve the proposed ground levels excavation of up to 2.0 m will be required in the area of the soil mound along the eastern boundary and filling of up to 2.0 m will be required within the existing pool.

At the time of DP's investigation the proposed development was also to include the demolition of the existing car park and construction of a new car park along the south western boundary of the site, however, it is understood that the existing car park is now to be retained.

7.2 Settlement Analysis

The results of the additional testing have shown that the thickness of the soil profile is quite variable beneath the site generally increasing from about 1.6 m in the south-west to 32.5 m towards the north east.

On this site most of the settlement is likely to occur within the existing and new filling, soft to firm clay and very loose to loose sand layers which are generally within a depth of about 6.5 m of the existing ground levels. Settlement of the underlying stiff to hard clays and medium dense sands is likely to be insignificant under the proposed loads.

The thickness of the existing filling ranges from about 3.5 m to 5.5 m across the site. The soft to firm clay layers or very loose to loose sands are mostly present below the filling in the north-eastern portion of the site.

As some areas of the site are expected to be cut and the amount of new fill to be placed varies across the site, the surcharge loads applied to the underlying soils vary. This varying pressure, in combination with differing thicknesses of the filling, loose sand and soft to firm clay layers, may result in differential settlements across the site.

The total long term settlement is a combination of consolidation settlement and creep settlement. Consolidation settlement in sands is relatively rapid but consolidation of clays takes considerably longer, primarily dependent on the thickness of the clay layer. Creep settlement can occur both in soft to firm clays and in loose sands, and is a gradual process which will occur for many years after completion of construction. Creep settlement will also occur in filling, even when it has been well compacted.

For this site the settlement analysis has been undertaken using one-dimensional consolidation theory, using coefficients of compressibility (m_v) derived from the cone resistance values, coefficients of consolidation (c_v) estimated from the soil type, the dissipation tests and previous experience, and creep coefficients (c_a) based on previous experience in similar soils.

The range of predicted total settlements for a range of different soil conditions and different fill heights are summarised in Table 5 for different times after construction is finished. In the analysis the most favourable soil conditions have been based on the soil profile in CPT204 where there was no soft clay layer and a relatively shallow soil profile, and the least favourable soil conditions have been based on the soil profiles in CPT201 and CPT207 which intersected the thickest soft clay layers and the deepest soil profile.

Table 5: Estimated Total Settlements at different times

Time after placement of fill (years)	Estimated Total Settlements (mm)			
	New fill height (0-0.5 m)		New fill height (1.5-2 m)	
	Most favourable profile	Least favourable profile	Most favourable profile	Least favourable profile
1	10	15	35	40
10	30	50	60	80
50	45	75	70	100

The results indicate that the total settlement across the site, under the proposed regrading works, is predicted to increase from about 30 mm to 80 mm within the next 10 years to about 45 mm to 100 mm over the next 50 years.

In order to estimate the potential differential settlement across the future playing fields it is necessary to estimate how quickly the ground conditions or the fill height will change across the site.

As the main area of proposed fill is associated with the backfilling of the existing pool it is anticipated that the largest amount of settlement would be located at the middle of the existing pool above the least favourable soil profile reducing toward the edge of the existing pool where no fill is proposed.

DP expects that the changes in ground conditions are more gradual than the changes in fill depths and we have conservatively assumed that the ground conditions could change from best to worst profile over 10 m. Under a constant fill height of 2 m the potential differential settlement due to changes in the soil profile is 5 mm over 10 m at 1 year (1:2000), 20 mm over 10 m at 10 years (1:500) and 30 mm at 50 years (~1:300).

These estimates of differential settlement are likely to be upper bound values as the analysis is based on one dimensional theory. DP predicts that the actual differential settlements will probably be 50% of those quoted above.

It should be noted that accurate prediction of settlements is always very difficult as a range of consolidation properties have to be estimated for each soil layer, the mathematical equations used may not accurately predict the behaviour of real soils, and the soil conditions are likely to vary between test locations. DP recommends that the predictions of total settlement and differential settlement provided in this report be taken as estimates only of the order of magnitude of likely settlements.

7.3 Site Preparation and Ground Improvement

Most of the settlement is predicted to occur within the existing filling, loose sands and soft to firm clays in the upper 6.5 m. Due to the shallow groundwater table (about 1.2 m to 2.8 m below the proposed ground levels) excavation and re-compaction of the top 6.5 m is not feasible without extensive dewatering works.

Potential options which could be considered to reduce settlements are:

- Dynamic compaction of the near surface layers using a very large weight dropping a significant height; or
- Impact rolling using a square or triangular shaped roller to increase the depth of compaction.

The above options are likely to be expensive as they involve specialised equipment and would have to be installed by experienced contractors. In addition, the depth of compaction of both the dynamic compaction and impact rolling will be affected by the shallow groundwater level, with previous experience showing that soils below the water table do not improve significantly with either of these methods.

Given that DP's estimates of settlement are expected to be upper bound values, DP suggests that a lower level of ground treatment is possible to reduce the settlement by compacting the near surface layers above the water table.

DP suggests the following site preparation be considered:

- Excavate the existing fill over the whole site to 0.5 m below the proposed finished levels as required for placement of the new fill in accordance with the site remediation strategy;
- During demolition of the existing pool shell, excavate the sides of the existing pool to form sloping batters with overall slopes not steeper than 1:1.5 Vertical to Horizontal and preferably stepped to allow for compaction of new filling in horizontal layers;
- Compact the exposed subgrade as much as possible using either standard heavy rollers or an impact roller. If the soft clay fill is exposed in any area, then a suggested procedure would be to place a layer of geofabric across the exposed clay and then place and compact the first layer of new fill above the geofabric;
- Preference for imported fill should be given to a well graded granular material such as a ripped sandstone with a maximum particle size of 150 mm.
- Place the new fill in maximum 250 mm thick loose layers and compact to achieve a dry density ratio of between 98% and 102% relative to Standard compaction, with moisture contents maintained within 2% of Standard optimum moisture content; and
- Undertake density testing of the fill as it is compacted in accordance with the requirements of AS 3798:2007.

The fill on the site is suitable for reuse as engineered fill provided it has a maximum particle size of 150 mm and contains less than 5% organic or foreign materials. Reuse should also consider the contamination status and is subject to approval by an environmental consultant.

7.4 Structure Foundations

Any heavily loaded or rigid structures which are not tolerant of settlements should be founded in the stiff to hard clays or medium dense sands below the existing filling, loose sands and soft to firm clays. On some parts of the site sandstone bedrock is at relatively shallow depths and the footings may be founded on the bedrock.

Piled foundations such as grout-injected (continuous flight auger (CFA)) piles or bored piles are likely to be the most suitable foundation type to support these structures. Shallow footings, such as pad footings or strip footings, are unlikely to be suitable on this site, except for very lightly loaded structures, due to the low bearing capacity, likely settlements and reduced capacity for uplift and overturning of the near surface soils.

Standard bored piles may be used but, due to the high groundwater level and sandy layers, it will be necessary to use temporary casing during construction to support the open holes, together with tremmie pouring of concrete to the bottom of the pile.

Grout-injected piles (or CFA piles) are generally better suited to the soil conditions on this site as these piles do not need to utilise temporary casing or require the pile shaft to be drilled under bentonite, so drilling and concreting of the piles is relatively straightforward.

Suggested maximum allowable pressures for the various strata are presented in Table 6. Shaft adhesion values for uplift (tension) may be taken as being equal to 50% of the values for compression.

Table 6: Recommended Design Parameters for Foundation Design

Foundation Stratum	Maximum Allowable		Maximum Ultimate	
	End Bearing (kPa)	Shaft Adhesion (Compression) (kPa)	End Bearing (kPa)	Shaft Adhesion (Compression) (kPa)
Stiff to Very Stiff Clay and Medium Dense Sand	400	15	1000	20
Sandstone Bedrock	1000	100	3000	150

Foundations proportioned on the basis of the allowable bearing pressures in Table 6 would be expected to experience total settlements of less than 1% of the pile diameter under the applied compression working load, with differential settlements between adjacent columns expected to be less than half of this value.

7.5 Pavement Design

Laboratory testing was performed on two samples of fill from the area of the proposed car park. The CBR test values from the sandy fill were 45% and 50%. For design of pavements, however, DP recommends that a design CBR value of 10% is adopted to allow for potential variability of material types and compaction within the existing filling.

8. Limitations

Douglas Partners (DP) has prepared this report for this project at the former Kogarah War Memorial Pool, Carss Park in accordance with DP's proposal SYD200681.P.001.Rev0 dated 1 July 2020. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of SJB Architects c/-SJB Planning for this project only and for the purposes as described in the report. It may also be used by Georges River Council under the same DP Conditions of Engagement.

It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

The scope for work for this investigation/report did not include the assessment of surface or sub-surface materials or groundwater for contaminants, within or adjacent to the site. Should evidence of fill of unknown origin be noted in the report, and in particular the presence of building demolition materials, it should be recognised that there may be some risk that such fill may contain contaminants and hazardous building materials.

The contents of this report do not constitute formal design components such as are required, by the Health and Safety Legislation and Regulations, to be included in a Safety Report specifying the hazards likely to be encountered during construction and the controls required to mitigate risk. This design process requires risk assessment to be undertaken, with such assessment being dependent upon factors relating to likelihood of occurrence and consequences of damage to property and to life. This, in turn, requires project data and analysis presently beyond the knowledge and project role respectively of DP. DP may be able, however, to assist the client in carrying out a risk assessment of potential hazards contained in the Comments section of this report, as an extension to the current scope of works, if so requested, and provided that suitable additional information is made available to DP. Any such risk assessment would, however, be necessarily restricted to the geotechnical components set out in this report and to their application by the project designers to project design, construction, maintenance and demolition.

Douglas Partners Pty Ltd

Appendix A

About This Report

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

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This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

Sampling Methods

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Sampling

Sampling is carried out during drilling or test pitting to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing it to obtain a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3 m for a backhoe and up to 6 m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site.

Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 300 mm or larger in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

Continuous Spiral Flight Augers

The borehole is advanced using 90-115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are disturbed and may be mixed with soils from the sides of the hole. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively low reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

Non-core Rotary Drilling

The borehole is advanced using a rotary bit, with water or drilling mud being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from the rate of penetration. Where drilling mud is used this can mask the cuttings and reliable identification is only possible from separate sampling such as SPTs.

Continuous Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, Methods of Testing Soils for Engineering Purposes - Test 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of, say, 4, 6 and 7 as:

  4,6,7
  N=13

- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:

  15, 30/40 mm

The results of the SPT tests can be related empirically to the engineering properties of the soils.

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

Dynamic penetrometer tests (DCP or PSP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rod penetrates the soil the number of blows required to penetrate each successive 150 mm depth are recorded. Normally there is a depth limitation of 1.2 m, but this may be extended in certain conditions by the use of extension rods. Two types of penetrometer are commonly used.

- Perth sand penetrometer - a 16 mm diameter flat ended rod is driven using a 9 kg hammer dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.
- Cone penetrometer - a 16 mm diameter rod with a 20 mm diameter cone end is driven using a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). This test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various road authorities.

Soil Descriptions

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are generally based on Australian Standard AS1726:2017, Geotechnical Site Investigations. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

The sand and gravel sizes can be further subdivided as follows:

Type	Particle size (mm)
Coarse gravel	19 - 63
Medium gravel	6.7 - 19
Fine gravel	2.36 – 6.7
Coarse sand	0.6 - 2.36
Medium sand	0.21 - 0.6
Fine sand	0.075 - 0.21

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

The proportions of secondary constituents of soils are described as follows:

In fine grained soils (>35% fines)

Term	Proportion of sand or gravel	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	>30%	Sandy Clay
With	15 – 30%	Clay with sand
Trace	0 - 15%	Clay with trace sand

In coarse grained soils (>65% coarse)
- with clays or silts

Term	Proportion of fines	Example
And	Specify	Sand (70%) and Clay (30%)
Adjective	>12%	Clayey Sand
With	5 - 12%	Sand with clay
Trace	0 - 5%	Sand with trace clay

In coarse grained soils (>65% coarse)
- with coarser fraction

Term	Proportion of coarser fraction	Example
And	Specify	Sand (60%) and Gravel (40%)
Adjective	>30%	Gravelly Sand
With	15 - 30%	Sand with gravel
Trace	0 - 15%	Sand with trace gravel

The presence of cobbles and boulders shall be specifically noted by beginning the description with ‘Mix of Soil and Cobbles/Boulders’ with the word order indicating the dominant first and the proportion of cobbles and boulders described together.

Soil Descriptions

Cohesive Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	VS	<12
Soft	S	12 - 25
Firm	F	25 - 50
Stiff	St	50 - 100
Very stiff	VSt	100 - 200
Hard	H	>200
Friable	Fr	-

Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

Relative Density	Abbreviation	Density Index (%)
Very loose	VL	<15
Loose	L	15-35
Medium dense	MD	35-65
Dense	D	65-85
Very dense	VD	>85

Soil Origin

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil - derived from in-situ weathering of the underlying rock;
- Extremely weathered material – formed from in-situ weathering of geological formations. Has soil strength but retains the structure or fabric of the parent rock;
- Alluvial soil – deposited by streams and rivers;
- Estuarine soil – deposited in coastal estuaries;
- Marine soil – deposited in a marine environment;
- Lacustrine soil – deposited in freshwater lakes;
- Aeolian soil – carried and deposited by wind;
- Colluvial soil – soil and rock debris transported down slopes by gravity;
- Topsoil – mantle of surface soil, often with high levels of organic material.
- Fill – any material which has been moved by man.

Moisture Condition – Coarse Grained Soils

For coarse grained soils the moisture condition should be described by appearance and feel using the following terms:

- Dry (D) Non-cohesive and free-running.
- Moist (M) Soil feels cool, darkened in colour.

  Soil tends to stick together.

  Sand forms weak ball but breaks easily.
- Wet (W) Soil feels cool, darkened in colour.

  Soil tends to stick together, free water forms when handling.

Moisture Condition – Fine Grained Soils

For fine grained soils the assessment of moisture content is relative to their plastic limit or liquid limit, as follows:

- 'Moist, dry of plastic limit' or 'w <PL' (i.e. hard and friable or powdery).
- 'Moist, near plastic limit' or 'w ≈ PL (i.e. soil can be moulded at moisture content approximately equal to the plastic limit).
- 'Moist, wet of plastic limit' or 'w >PL' (i.e. soils usually weakened and free water forms on the hands when handling).
- 'Wet' or 'w ≈LL' (i.e. near the liquid limit).
- 'Wet' or 'w >LL' (i.e. wet of the liquid limit).

Rock Strength

Rock strength is defined by the Unconfined Compressive Strength and it refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects.

The Point Load Strength Index $Is_{(50)}$ is commonly used to provide an estimate of the rock strength and site specific correlations should be developed to allow UCS values to be determined. The point load strength test procedure is described by Australian Standard AS4133.4.1-2007. The terms used to describe rock strength are as follows:

Strength Term	Abbreviation	Unconfined Compressive Strength MPa	Point Load Index * $Is_{(50)}$ MPa
Very low	VL	0.6 - 2	0.03 - 0.1
Low	L	2 - 6	0.1 - 0.3
Medium	M	6 - 20	0.3 - 1.0
High	H	20 - 60	1 - 3
Very high	VH	60 - 200	3 - 10
Extremely high	EH	>200	>10

* Assumes a ratio of 20:1 for UCS to $Is_{(50)}$. It should be noted that the UCS to $Is_{(50)}$ ratio varies significantly for different rock types and specific ratios should be determined for each site.

Degree of Weathering

The degree of weathering of rock is classified as follows:

Term	Abbreviation	Description
Residual Soil	RS	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are no longer visible, but the soil has not been significantly transported.
Extremely weathered	XW	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible
Highly weathered	HW	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is significantly changed by weathering. Some primary minerals have weathered to clay minerals. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
Moderately weathered	MW	The whole of the rock material is discoloured , usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable, but shows little or no change of strength from fresh rock.
Slightly weathered	SW	Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.
Fresh	FR	No signs of decomposition or staining.
Note: If HW and MW cannot be differentiated use DW (see below)		
Distinctly weathered	DW	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching or may be decreased due to deposition of weathered products in pores.

Rock Descriptions

Degree of Fracturing

The following classification applies to the spacing of natural fractures in diamond drill cores. It includes bedding plane partings, joints and other defects, but excludes drilling breaks.

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with occasional fragments
Fractured	Core lengths of 30-100 mm with occasional shorter and longer sections
Slightly Fractured	Core lengths of 300 mm or longer with occasional sections of 100-300 mm
Unbroken	Core contains very few fractures

Rock Quality Designation

The quality of the cored rock can be measured using the Rock Quality Designation (RQD) index, defined as:

$$\text{RQD \%} = \frac{\text{cumulative length of 'sound' core sections} \geq \text{100 mm long}}{\text{total drilled length of section being assessed}}$$

where 'sound' rock is assessed to be rock of low strength or stronger. The RQD applies only to natural fractures. If the core is broken by drilling or handling (i.e. drilling breaks) then the broken pieces are fitted back together and are not included in the calculation of RQD.

Stratification Spacing

For sedimentary rocks the following terms may be used to describe the spacing of bedding partings:

Term	Separation of Stratification Planes
Thinly laminated	< 6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	> 2 m

Symbols & Abbreviations

Douglas Partners

Introduction

These notes summarise abbreviations commonly used on borehole logs and test pit reports.

Drilling or Excavation Methods

C	Core drilling
R	Rotary drilling
SFA	Spiral flight augers
NMLC	Diamond core - 52 mm dia
NQ	Diamond core - 47 mm dia
HQ	Diamond core - 63 mm dia
PQ	Diamond core - 81 mm dia

Water

▷	Water seep
▽	Water level

Sampling and Testing

A	Auger sample
B	Bulk sample
D	Disturbed sample
E	Environmental sample
U_{50}	Undisturbed tube sample (50mm)
W	Water sample
pp	Pocket penetrometer (kPa)
PID	Photo ionisation detector
PL	Point load strength Is(50) MPa
S	Standard Penetration Test
V	Shear vane (kPa)

Description of Defects in Rock

The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

Defect Type

B	Bedding plane
Cs	Clay seam
Cv	Cleavage
Cz	Crushed zone
Ds	Decomposed seam
F	Fault
J	Joint
Lam	Lamination
Pt	Parting
Sz	Sheared Zone
V	Vein

Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

h	horizontal
v	vertical
sh	sub-horizontal
sv	sub-vertical

Coating or Infilling Term

cln	clean
co	coating
he	healed
inf	infilled
stn	stained
ti	tight
vn	veneer

Coating Descriptor

ca	calcite
cbs	carbonaceous
cly	clay
fe	iron oxide
mn	manganese
slt	silty

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

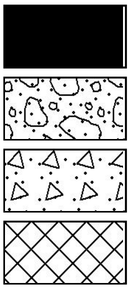
Other

fg	fragmented
bnd	band
qtz	quartz

Symbols & Abbreviations

Graphic Symbols for Soil and Rock

General



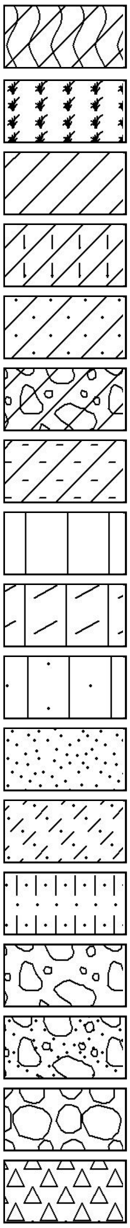
Asphalt

Road base

Concrete

Filling

Soils



Topsoil

Peat

Clay

Silty clay

Sandy clay

Gravelly clay

Shaly clay

Silt

Clayey silt

Sandy silt

Sand

Clayey sand

Silty sand

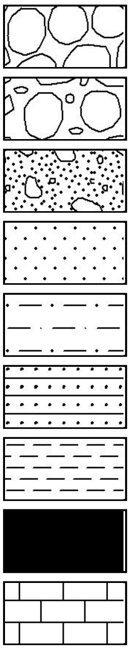
Gravel

Sandy gravel

Cobbles, boulders

Talus

Sedimentary Rocks



Boulder conglomerate

Conglomerate

Conglomeratic sandstone

Sandstone

Siltstone

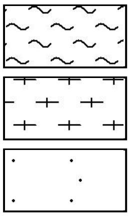
Laminite

Mudstone, claystone, shale

Coal

Limestone

Metamorphic Rocks

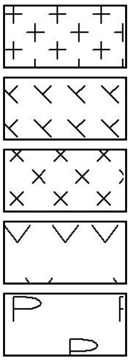


Slate, phyllite, schist

Gneiss

Quartzite

Igneous Rocks



Granite

Dolerite, basalt, andesite

Dacite, epidote

Tuff, breccia

Porphyry

Cone Penetration Tests

Douglas Partners

Introduction

The Cone Penetration Test (CPT) is a sophisticated soil profiling test carried out in-situ. A special cone shaped probe is used which is connected to a digital data acquisition system. The cone and adjoining sleeve section contain a series of strain gauges and other transducers which continuously monitor and record various soil parameters as the cone penetrates the soils.

The soil parameters measured depend on the type of cone being used, however they always include the following basic measurements

• Cone tip resistance	q_c
• Sleeve friction	f_s
• Inclination (from vertical)	i
• Depth below ground	z

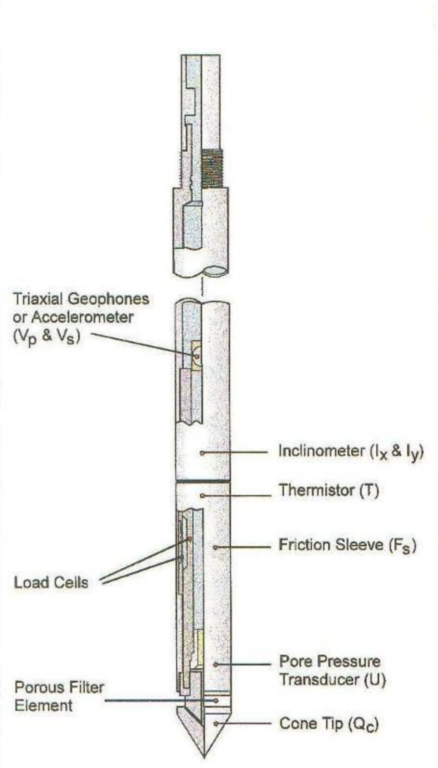


Figure 1: Cone Diagram

The inclinometer in the cone enables the verticality of the test to be confirmed and, if required, the vertical depth can be corrected.

The cone is thrust into the ground at a steady rate of about 20 mm/sec, usually using the hydraulic rams of a purpose built CPT rig, or a drilling rig. The testing is carried out in accordance with the Australian Standard AS1289 Test 6.5.1.

Figure 2: Purpose built CPT rig

The CPT can penetrate most soil types and is particularly suited to alluvial soils, being able to detect fine layering and strength variations. With sufficient thrust the cone can often penetrate a short distance into weathered rock. The cone will usually reach refusal in coarse filling, medium to coarse gravel and on very low strength or better rock. Tests have been successfully completed to more than 60 m.

Types of CPTs

Douglas Partners (and its subsidiary GroundTest) owns and operates the following types of CPT cones:

Type	Measures
Standard	Basic parameters (q_c, f_s, i & z)
Piezocone	Dynamic pore pressure (u) plus basic parameters. Dissipation tests estimate consolidation parameters
Conductivity	Bulk soil electrical conductivity (σ) plus basic parameters
Seismic	Shear wave velocity (V_s), compression wave velocity (V_p), plus basic parameters

Strata Interpretation

The CPT parameters can be used to infer the Soil Behaviour Type (SBT), based on normalised values of cone resistance (Qt) and friction ratio (Fr). These are used in conjunction with soil classification charts, such as the one below (after Robertson 1990)

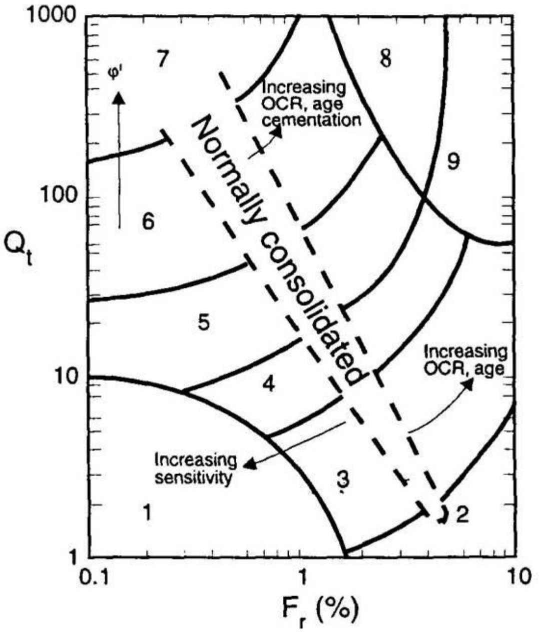


Figure 3: Soil Classification Chart

DP's in-house CPT software provides computer aided interpretation of soil strata, generating soil descriptions and strengths for each layer. The software can also produce plots of estimated soil parameters, including modulus, friction angle, relative density, shear strength and over consolidation ratio.

DP's CPT software helps our engineers quickly evaluate the critical soil layers and then focus on developing practical solutions for the client's project.

Engineering Applications

There are many uses for CPT data. The main applications are briefly introduced below:

Settlement

CPT provides a continuous profile of soil type and strength, providing an excellent basis for settlement analysis. Soil compressibility can be estimated from cone derived moduli, or known consolidation parameters for the critical layers (eg. from laboratory testing). Further, if pore pressure dissipation tests are undertaken using a piezocone, in-situ consolidation coefficients can be estimated to aid analysis.

Pile Capacity

The cone is, in effect, a small scale pile and, therefore, ideal for direct estimation of pile capacity. DP's in-house program ConePile can analyse most pile types and produces pile capacity versus depth plots. The analysis methods are based on proven static theory and empirical studies, taking account of scale effects, pile materials and method of installation. The results are expressed in limit state format, consistent with the Piling Code AS2159.

Dynamic or Earthquake Analysis

CPT and, in particular, Seismic CPT are suitable for dynamic foundation studies and earthquake response analyses, by profiling the low strain shear modulus G_0. Techniques have also been developed relating CPT results to the risk of soil liquefaction.

Other Applications

Other applications of CPT include ground improvement monitoring (testing before and after works), salinity and contaminant plume mapping (conductivity cone), preloading studies and verification of strength gain.

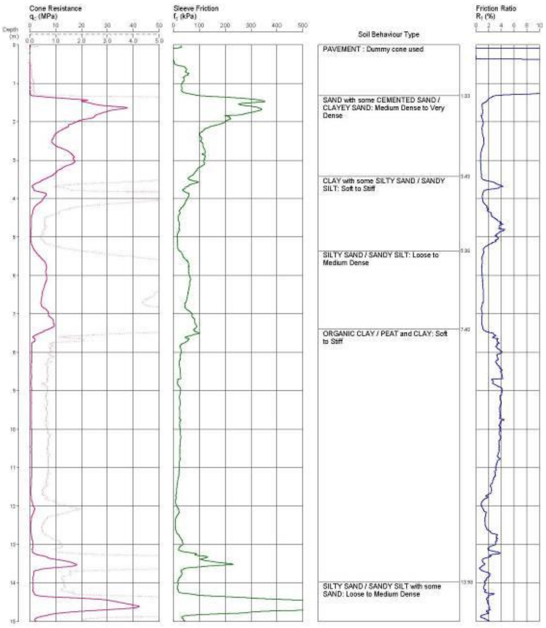
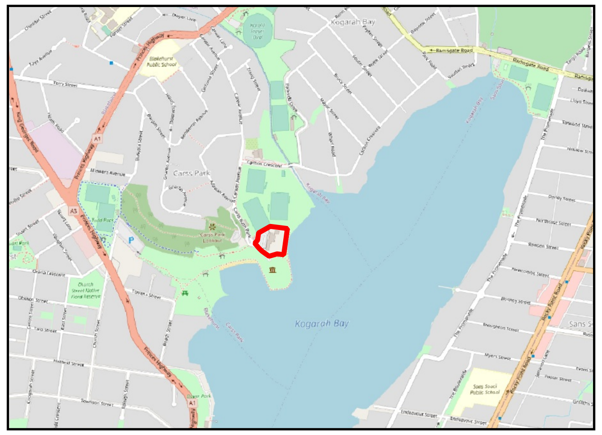


Figure 4: Sample Cone Plot

Appendix B

Drawings



LOCALITY MAP

Notes:
1. Basemap from nearmap.com (dated 01/06/2020)
2. Test locations shown are approximate only

Legend

Previous Test Locations

- ⊕ Geotechnical Investigation (Construction Sciences, 2019)

Current Test Locations

- ⊕ Pavement Boreholes
- ▲ Environmental Monitoring Wells
- ⊕ Dynamic Cone Penetrometers
- ⊙ Cone Penetrometer Tests
- ▭ Approximate Site Boundary
- – – Approximate Location of Previous Shoreline
- A A' Geotechnical Cross Section A-A'

0 10 20 30 40 50 m

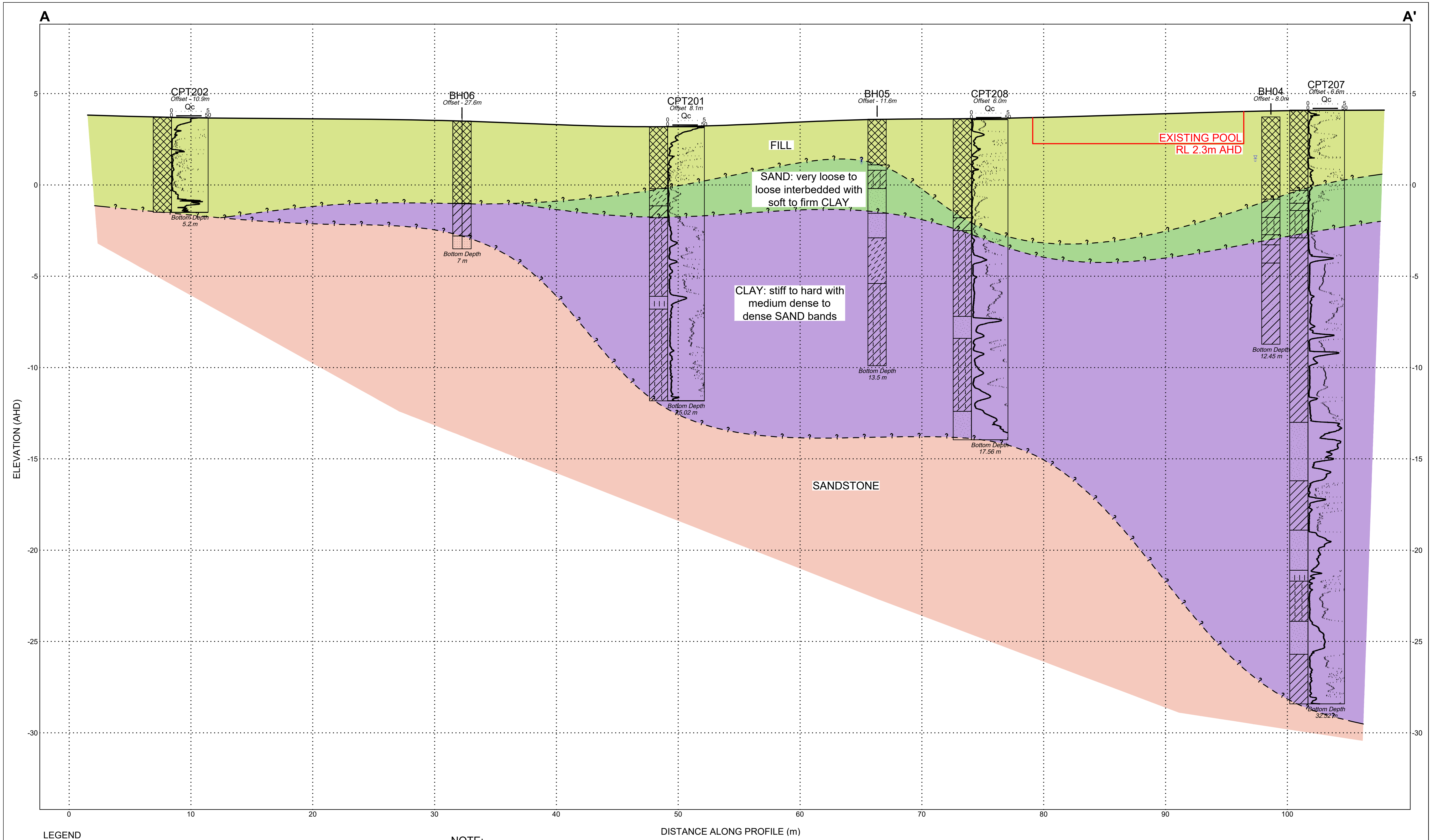
Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	SJB Architects		
OFFICE:	Sydney	DRAWN BY:	AH
SCALE:	1:750 @ A3	DATE:	18.08.2020

TITLE: **Test Location Plan**
Kogarah War Memorial Pool
Carss Park

N

PROJECT No:	99751.01
DRAWING No:	1
REVISION:	0



LEGEND

▨ Fill	☐ Sand
▨ Sandy Clay	▨ Clayey Sand
▨ Silty Clay	☐ Sandstone
▨ Clay	☐ Silty Sand

NOTE:

1. Subsurface conditions are accurate at borehole locations. Variations in subsurface conditions may occur between borehole locations. Interpreted strata boundaries are approximate and should be used as a guide only.
2. Summary logs only. Should be read in conjunction with detailed logs.
3. Test locations surveyed using differential GPS and measured using offsets from site features
4. BH04, BH05 and BH06 taken from Construction Sciences Report 5017200024 version 4 dated 12 November 2019

TESTS / OTHER

— ? — — - Interpreted Geotechnical Boundary

- Water level

0 6

Horizontal Scale (metres)

Vertical Exaggeration = 1.5

Douglas Partners
Geotechnics | Environment | Groundwater

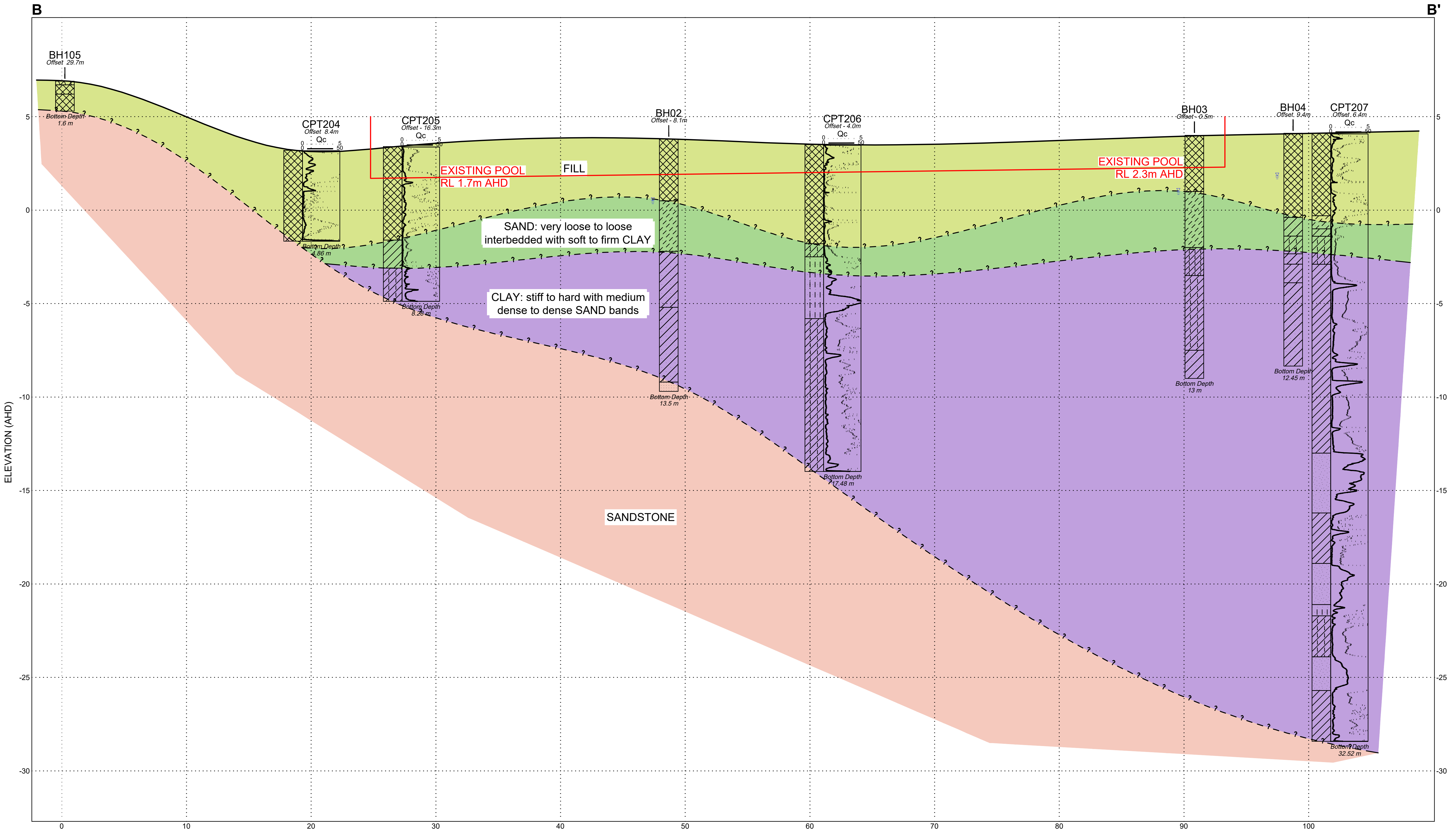
CLIENT: SJB Architects

OFFICE: Sydney
DRAWN BY: JDB

SCALE: 1:300 (H) 1:200 (V) @ A3
DATE: 19.08.2020

TITLE: Interpreted Geotechnical Cross-Section A-A'
Proposed Pool and Park Redevelopment
Kogarah War Memorial Pool, Carss Park

PROJECT No: 99751.01
DRAWING No: 2
REVISION: 0



LEGEND

- ▨ Fill
- ▨ Clayey Sand
- ▨ Sandy Clay
- ▨ Sandstone
- ▨ Sandy Silty Clay
- ▨ Silty Clay
- ▨ Clay
- ▨ Topsoil
- ▨ Silty Sand
- ▨ Sand

NOTE:

1. Subsurface conditions are accurate at borehole locations. Variations in subsurface conditions may occur between borehole locations. Interpreted strata boundaries are approximate and should be used as a guide only.
2. Summary logs only. Should be read in conjunction with detailed logs.
3. Test locations surveyed using differential GPS and measured using offsets from site features
4. BH02, BH03 and BH04 taken from Construction Sciences Report 5017200024 version 4 dated 12 November 2019

TESTS / OTHER

— ? — — - Interpreted Geotechnical Boundary

▽ - Water level

0 6

Horizontal Scale (metres)

Vertical Exaggeration = 1.5

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Geotechnics | Environment | Groundwater

CLIENT: SJB Architects

OFFICE: Sydney

DRAWN BY: JDB

SCALE: 1:300 (H) 1:200 (V) @ A3

DATE: 13.08.2020

TITLE: Interpreted Geotechnical Cross-Section B-B'
Proposed Pool and Park Redevelopment
Kogarah War Memorial Pool, Carss Park

PROJECT No: 99751.01

DRAWING No: 3

REVISION: 0

Appendix C

Field Work Results

BOREHOLE LOG

CLIENT: SJB Architects
PROJECT: Proposed Pool and Park Redevelopment
LOCATION: Kograh War Memorial Pool, Carss Park

SURFACE LEVEL: 3.1 AHD
EASTING: 326369
NORTHING: 6237466
DIP/AZIMUTH: 90°/--

BORE No: BH101(G)
PROJECT No: 99751.01
DATE: 22/7/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.06	ASPHALTIC CONCRETE	■						
	0.3	FILL/Gravelly SAND: fine to medium, dark grey-brown, angular-subangular igneous gravel (20mm), dry, apparently well compacted	▨	A	0.1 0.2				
	0.7	FILL/SAND: fine to medium, brown, with pale grey and red brown clay clumps, trace rootlets, trace tile and glass fragments, dry	▨	A	0.6 0.7				
		Bore discontinued at 0.7m - target depth reached							

RIG: 5.5 tonne Excavator **DRILLER:** A&A Hire **LOGGED:** TM **CASING:** Uncased

TYPE OF BORING: Solid Flight Auger (300mm diameter) to 0.7m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Location within 1m of environmental borehole BH101(E)

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics | Environment | Groundwater

BOREHOLE LOG

CLIENT: SJB Architects
PROJECT: Proposed Pool and Park Redevelopment
LOCATION: Kograh War Memorial Pool, Carss Park

SURFACE LEVEL: 3.6 AHD
EASTING: 326334
NORTHING: 6237442
DIP/AZIMUTH: 90°/--

BORE No: BH102(G)
PROJECT No: 99751.01
DATE: 22/7/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.02	ASPHALTIC CONCRETE	■						
		FILL/Gravelly SAND: fine to medium, dark grey-brown, subangular to angular igneous gravel (20mm), moist, apparently well compacted From 0.3m: dark grey	▨	A	0.1 0.2				
	0.4	FILL/SAND: fine to medium, pale grey, moist	▨						
3	0.48	FILL/Gravelly SAND: dark grey and brown, fine to medium, trace sandstone gravel, trace slag, tile and brick fragments, moist	▨	A	0.7 0.8				
	0.8	Bore discontinued at 0.8m - target depth reached							
	1								1
2									
	2								2
1									
	3								3
0									

RIG: 5.5 tonne Excavator **DRILLER:** A&A Hire **LOGGED:** TM **CASING:** Uncased
TYPE OF BORING: Solid Flight Auger (300mm diameter) to 0.8m
WATER OBSERVATIONS: No free groundwater observed
REMARKS: Location within 1m of environmental borehole BH101(E)

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

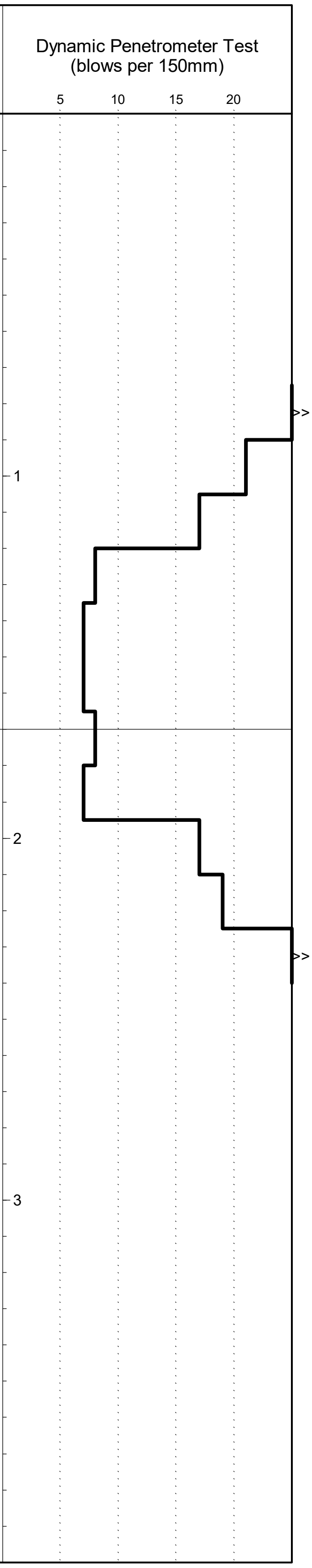
BOREHOLE LOG

CLIENT: SJB Architects
PROJECT: Proposed Pool and Park Redevelopment
LOCATION: Kograh War Memorial Pool, Carss Park

SURFACE LEVEL: 4.6 AHD
EASTING: 326331
NORTHING: 6237415
DIP/AZIMUTH: 90°/--

BORE No: BH103(G)
PROJECT No: 99751.01
DATE: 22/7/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Sampling & In Situ Testing: Depth	Sampling & In Situ Testing: Sample	Sampling & In Situ Testing: Results & Comments	Water
	0.03	ASPHALTIC CONCRETE						
		FILL/Gravelly SAND: fine to medium, dark grey-brown, angular to subangular igneous gravel (20mm), dry, apparently well compacted		A A	0.1–0.2 0.5–0.6			
4	0.6	FILL/SAND: fine to medium, orange-brown, with red-brown angular to subangular sandstone gravel (10-70mm), dry, apparently well compacted		A	0.7–0.8			
	0.8	FILL/Clayey SAND: fine to medium, dark brown, with red-brown angular to subangular sandstone gravel (100mm), trace brick and glass fragments, dry, apparently variably compacted		B A A	0.8 1.1 1.3 1.4–1.5			
3	1.7	Bore discontinued at 1.7m - target depth reached						
2								
1								



RIG: 5.5 tonne Excavator **DRILLER:** A&A Hire **LOGGED:** TM **CASING:** Uncased
TYPE OF BORING: Solid Flight Auger (300mm diameter) to 1.7m
WATER OBSERVATIONS: No free groundwater observed
REMARKS: Location within 1m of environmental borehole BH101(E)

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

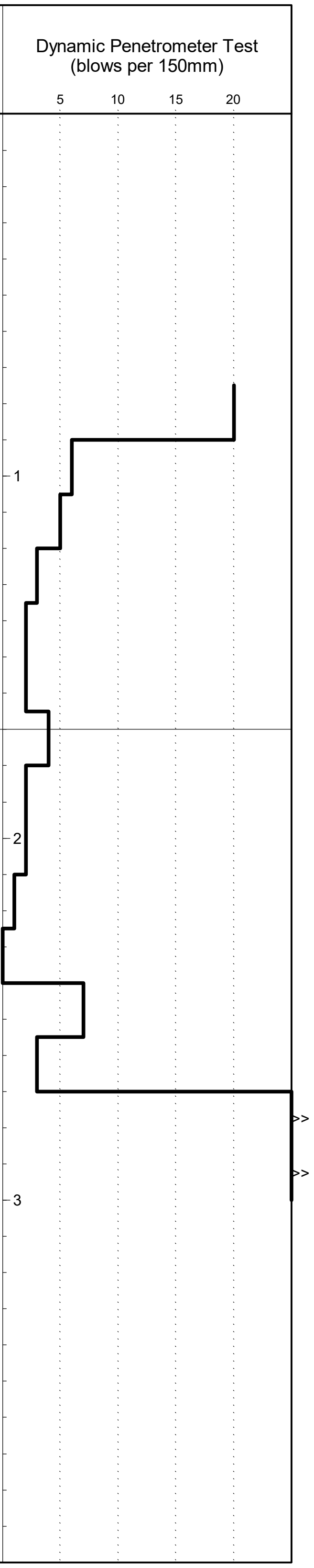
BOREHOLE LOG

CLIENT: SJB Architects
PROJECT: Proposed Pool and Park Redevelopment
LOCATION: Kograh War Memorial Pool, Carss Park

SURFACE LEVEL: 4.8 AHD
EASTING: 326351
NORTHING: 6237391
DIP/AZIMUTH: 90°/--

BORE No: BH104(G)
PROJECT No: 99751.01
DATE: 22/7/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing Type	Depth	Sample	Results & Comments	Water
	0.05	ASPHALTIC CONCRETE						
		FILL/Gravelly SAND: fine to medium, dark grey-brown, angular to subangular igneous gravel (20mm), dry, apparently well compacted From 0.25m: dark grey		A	0.1 0.2			
	0.35	FILL/SAND: medium to coarse, orange-brown, with red-brown angular to subangular ironstone and sandstone gravel (10-70mm), dry, apparently poorly compacted 0.7m: ironstone boulder		A	0.4 0.5			
4	0.8	FILL/SAND: fine to medium, dark brown, with angular to subangular igneous and sandstone gravel, dry, apparently poorly compacted		B A	0.8 1.2 1.3			
3	1.7	Bore discontinued at 1.7m - target depth reached						



RIG: 5.5 tonne Excavator **DRILLER:** A&A Hire **LOGGED:** TM **CASING:** Uncased
TYPE OF BORING: Solid Flight Auger (300mm diameter) to 1.7m
WATER OBSERVATIONS: No free groundwater observed
REMARKS: Location within 1m of environmental borehole BH101(E)

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

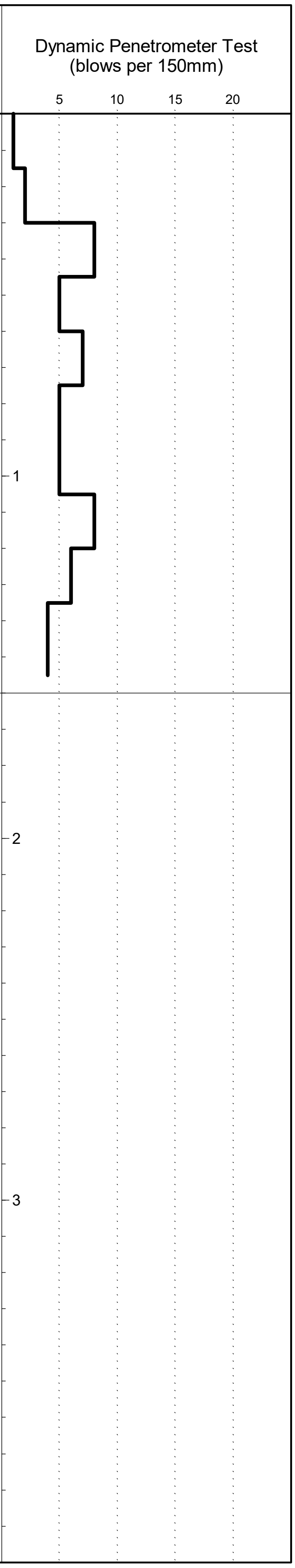
BOREHOLE LOG

CLIENT: SJB Architects
PROJECT: Proposed Pool and Park Redevelopment
LOCATION: Kograh War Memorial Pool, Carss Park

SURFACE LEVEL: 6.9 AHD
EASTING: 326366
NORTHING: 6237368
DIP/AZIMUTH: 90°/--

BORE No: BH105(G)
PROJECT No: 99751.01
DATE: 22/7/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water
		FILL/Silty SAND: fine to medium, dark grey, with rootlets, dry	▨	A	0.0 0.1			
	0.2	FILL/SAND: fine to medium, yellow-brown, trace sandstone gravel, dry, apparently moderately compacted	▨	A	0.5 0.6			
6	0.7	FILL/SAND: fine to medium, grey and red-brown, trace angular to subangular ironstone gravel (100mm), dry, apparently moderately compacted	▨	A B A	0.9 1.0 1.3 1.4			
5 4 3	1.6	Bore discontinued at 1.6m - auger refusal on inferred sandstone bedrock						



RIG: 5.5 tonne Excavator **DRILLER:** A&A Hire **LOGGED:** TM **CASING:** Uncased

TYPE OF BORING: Solid Flight Auger (300mm diameter) to 1.6m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Location within 1m of environmental borehole BH101(E)

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: SJB Architects
PROJECT: Proposed Pool and Park Redevelopment
LOCATION: Kograh War Memorial Pool, Carss Park

SURFACE LEVEL: 3.6 AHD
EASTING: 326354
NORTHING: 6237412
DIP/AZIMUTH: 90°/--

BORE No: BH106(G)
PROJECT No: 99751.01
DATE: 22/7/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details
				Type	Depth	Sample	Results & Comments		
	0.05	ASPHALTIC CONCRETE							
	0.29	FILL/Gravelly SAND: fine to medium, dark grey-brown, subangular to angular igneous gravel (20mm), dry, apparently well compacted		A	0.1 0.2				
3	0.8	FILL/Gravelly SAND: fine to medium, dark grey, with angular to subangular igneous and sandstone gravel, trace clay clumps, dry		A	0.7 0.8				
		Bore discontinued at 0.8m - target depth reached							
	1								1
2									
	2								2
1									
	3								3
0									

RIG: 5.5 tonne Excavator **DRILLER:** A&A Hire **LOGGED:** TM **CASING:** Uncased
TYPE OF BORING: Solid Flight Auger (300mm diameter) to 0.8m
WATER OBSERVATIONS: No free groundwater observed
REMARKS: Location within 1m of environmental borehole BH101(E)

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Results of Dynamic Penetrometer Tests

Client SJB Architects
Project Proposed Pool and Park Redevelopment
Location Kograh War Memorial Pool, Carss Park

Project No. 99751.01
Date 22/07/2020
Page No. 1 of 1

Test Location	BH103G	BH104G	BH105G	BH105GA	BH117G	BH118G	BH119G			
RL of Test (AHD)	4.6	4.8	7.3	7.3	3.7	4.1	3.4			
Depth (m)	**Penetration Resistance** Blows/150 mm									
0 - 0.15	E	E	2	1	E	E	E			
0.15 - 0.30	6/70	E	4	2	E	E	E			
0.30 - 0.45	5/20B	5/40B	2	8	12	4	7			
0.45 - 0.60	E	E	9	5	18	1	10			
0.60 - 0.75	E	E	6	7	12	3	15			
0.75 - 0.90	33	20	5	5	12	2	10			
0.90 - 1.05	21	6	6	5	8	2	9			
1.05 - 1.20	17	5	9	8	6	1	11			
1.20 - 1.35	8	3	1/10B	6	17	5	7			
1.35 - 1.50	7	2	10	4	17	2	6			
1.50 - 1.65	7	2	9/120/B	3/50/B	6	4	5			
1.65 - 1.80	8	4			8	2	6			
1.80 - 1.95	7	2			4	5	6			
1.95 - 2.10	17	2			6	4	1			
2.10 - 2.25	19	1			6	3	3			
2.25 - 2.40	35/110	0			4	3	3			
2.40 - 2.55		7			6	3	5			
2.55 - 2.70		3			3	7	6			
2.70 - 2.85		35			5	6	5			
2.85 - 3.00		35/70			4	5	5			
3.00 - 3.15					8	3	5			
3.15 - 3.30					7	5	3			
3.30 - 3.45					6	4	2			
3.45 - 3.60					6	4	4			

Test Method AS 1289.6.3.2, Cone Penetrometer ☑
AS 1289.6.3.3, Flat End Penetrometer ☐

Tested By TM
Checked By AH

Remarks R = Refusal, 35/110 indicates 35 blows for 110 mm penetration
B = Bouncing E = Excavated

CONE PENETRATION TEST

CLIENT: SJB ARCHITECTS

PROJECT: CARSS PARK, 78 CARWAR AVE, GEO

LOCATION: KOGARAH WAR MEMORIAL POOL, CARSS PARK

REDUCED LEVEL: 3.2

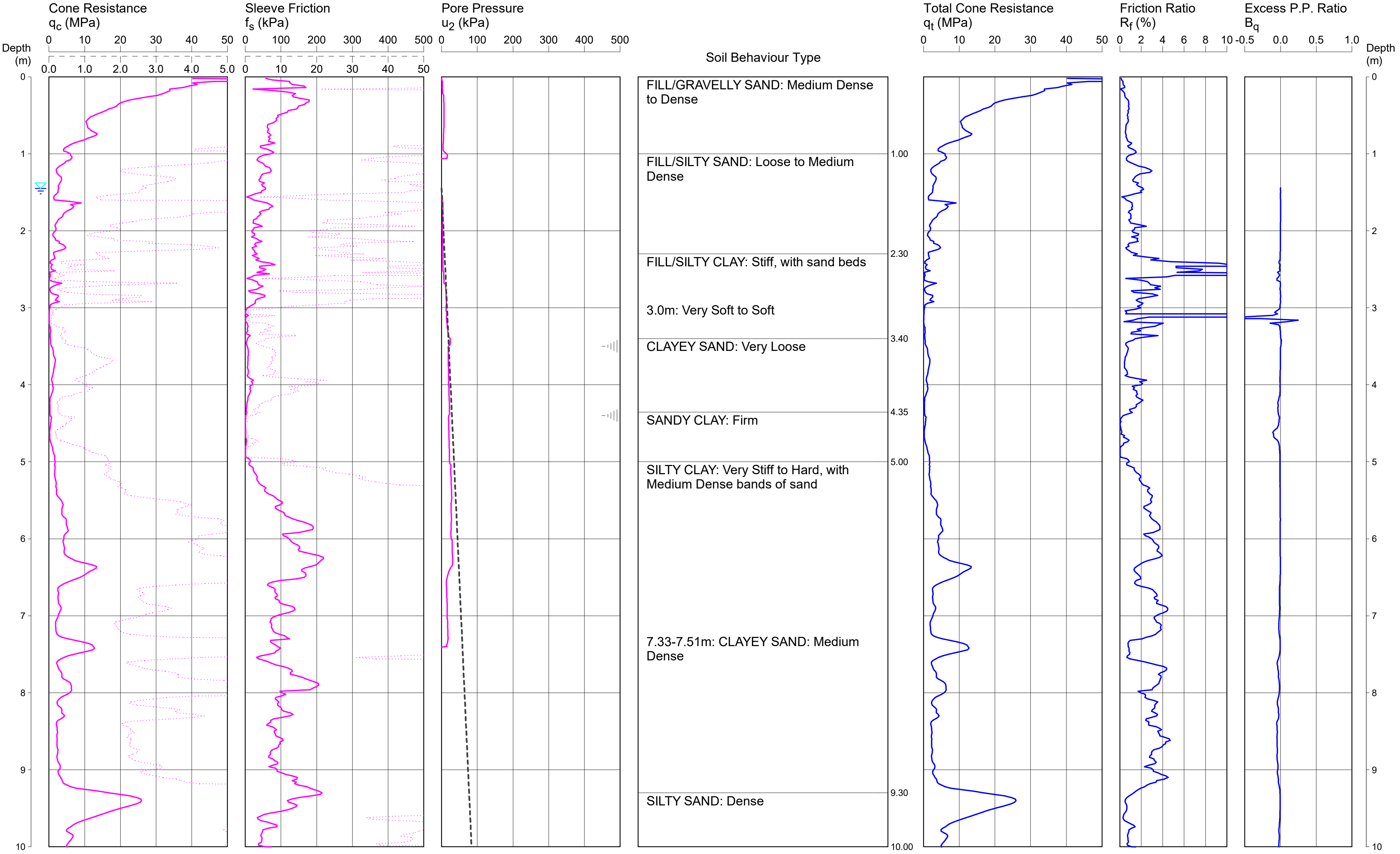
COORDINATES: 326369E 6237464N

CPT201

Page 1 of 2

DATE 28/07/2020

PROJECT No: 99751.01



Depth (m)	Soil Behaviour Type
0.00	FILL/GRAVELLY SAND: Medium Dense to Dense
1.00	FILL/SILTY SAND: Loose to Medium Dense
2.30	FILL/SILTY CLAY: Stiff, with sand beds 3.0m: Very Soft to Soft
3.40	CLAYEY SAND: Very Loose
4.35	SANDY CLAY: Firm
5.00	SILTY CLAY: Very Stiff to Hard, with Medium Dense bands of sand 7.33-7.51m: CLAYEY SAND: Medium Dense
9.30	SILTY SAND: Dense
10.00	

REMARKS: HOLE DISCONTINUED DUE TO SUDDEN BEND
GROUNDWATER OBSERVED AT 1.45m AFTER WITHDRAWAL OF RODS

Water depth after test: 1.45m depth (measured)

File: P:\99751.01 - CARSS PARK, 78 Carwar Ave, Geo\4.0 Field Work\4.2 Testing\CPTs\CPT201.CP5
Cone ID: 200150 **Type:** I-CFXYP20-10

ConePlot Version 5.9.2

-⦀ Dissipation Test

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CONE PENETRATION TEST

CLIENT: SJB ARCHITECTS

PROJECT: CARSS PARK, 78 CARWAR AVE, GEO

LOCATION: KOGARAH WAR MEMORIAL POOL, CARSS PARK

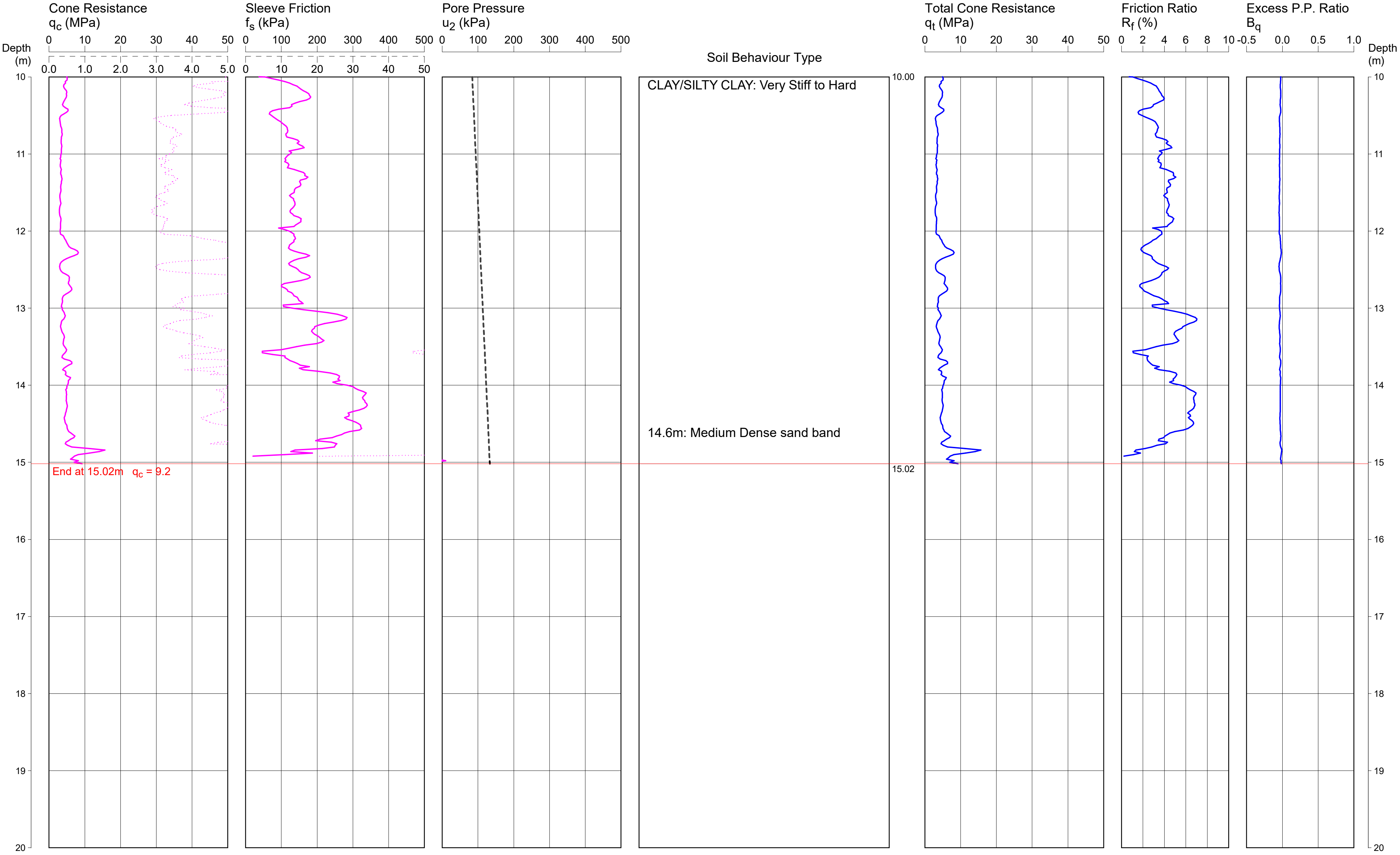
REDUCED LEVEL: 3.2

COORDINATES: 326369E 6237464N

CPT201

DATE 28/07/2020

PROJECT No: 99751.01



CLAY/SILTY CLAY: Very Stiff to Hard

14.6m: Medium Dense sand band

REMARKS: HOLE DISCONTINUED DUE TO SUDDEN BEND
GROUNDWATER OBSERVED AT 1.45m AFTER WITHDRAWAL OF RODS

Water depth after test: 1.45m depth (measured)

File: P:\99751.01 - CARSS PARK, 78 Carwar Ave, Geo\4.0 Field Work\4.2 Testing\CPTs\CPT201.CP5
Cone ID: 200150 **Type:** I-CFXYP20-10

ConePlot Version 5.9.2

Dissipation Test

Douglas Partners
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CONE PENETRATION TEST

CLIENT: SJB ARCHITECTS

PROJECT: CARSS PARK, 78 CARWAR AVE, GEO

LOCATION: KOGARAH WAR MEMORIAL POOL, CARSS PARK

REDUCED LEVEL: 3.7

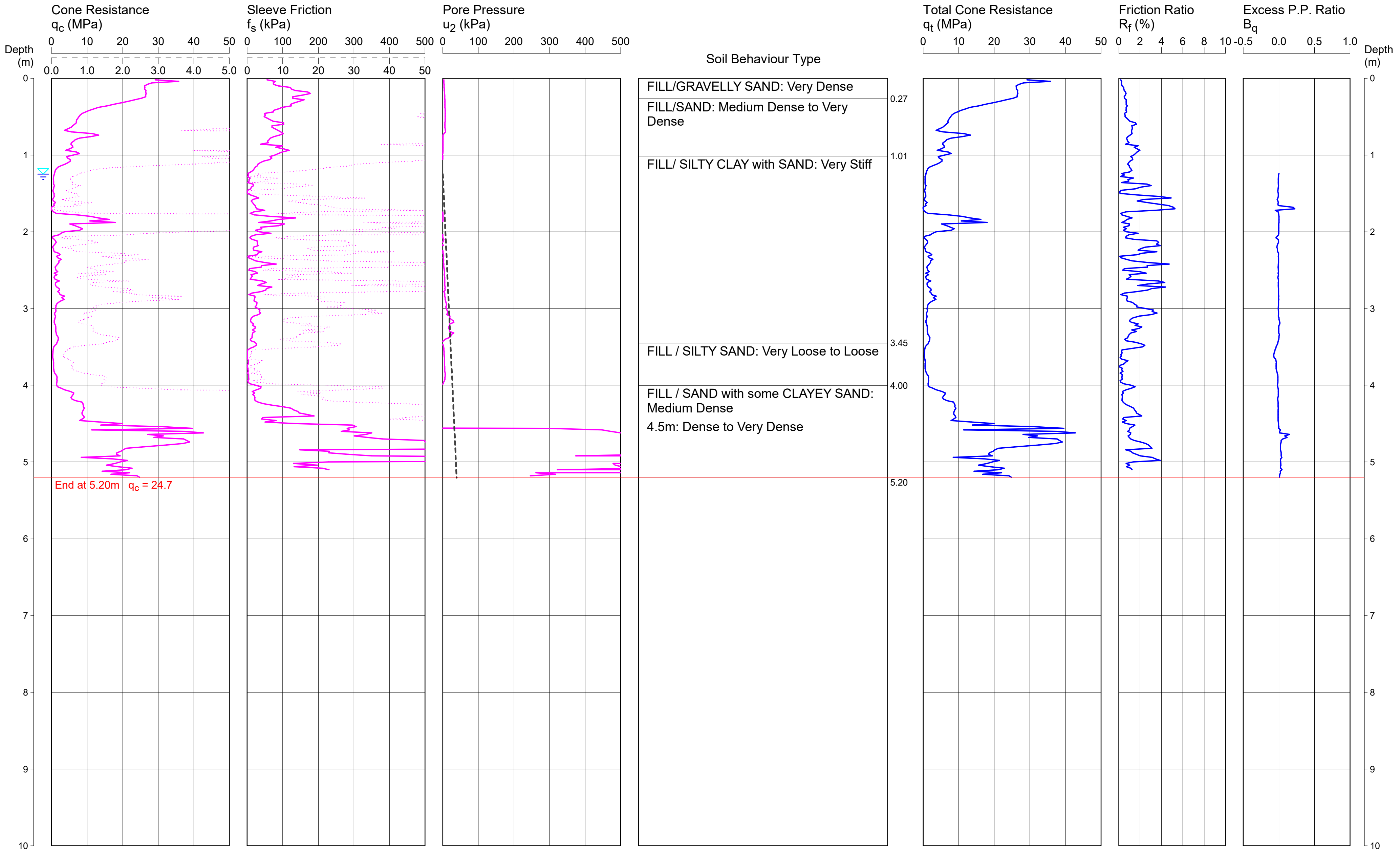
COORDINATES: 326331E 6237440N

CPT202

Page 1 of 1

DATE 28/07/2020

PROJECT No: 99751.01



REMARKS: HOLE DISCONTINUED DUE TO EXCESSIVE BENDING
GROUNDWATER OBSERVED AT 1.25m AFTER WITHDRAWAL OF RODS

Water depth after test: 1.25m depth (measured)

File: P:\99751.01 - CARSS PARK, 78 Carwar Ave, Geo\4.0 Field Work\4.2 Testing\CPTs\CPT202.CP5
Cone ID: 200309 **Type:** I-CFXYP20-10

ConePlot Version 5.9.2
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CONE PENETRATION TEST

CLIENT: SJB ARCHITECTS

PROJECT: CARSS PARK, 78 CARWAR AVE, GEO

LOCATION: KOGARAH WAR MEMORIAL POOL, CARSS PARK

REDUCED LEVEL: 4.7

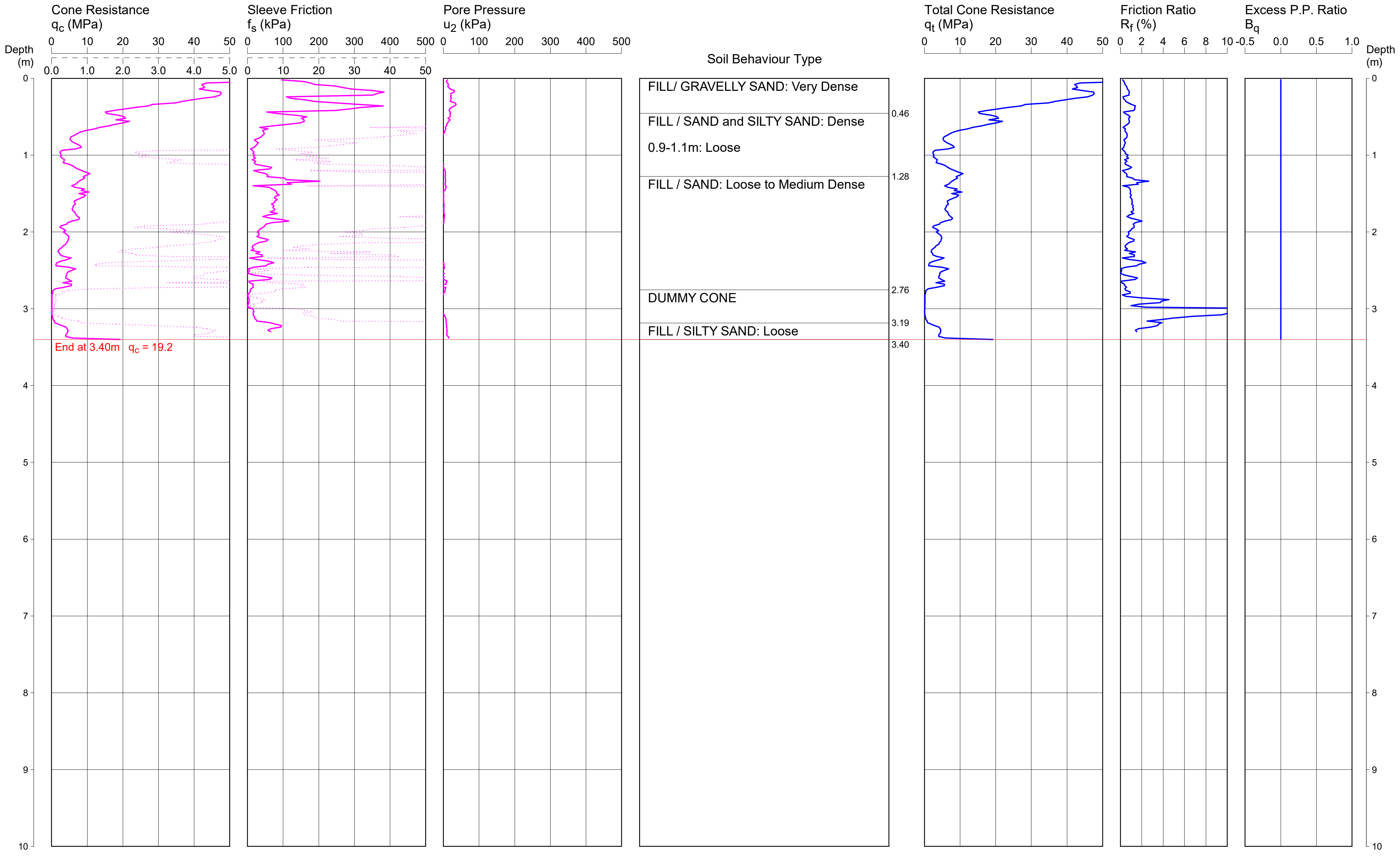
COORDINATES: 326358E 6237393N

CPT203

Page 1 of 1

DATE 28/07/2020

PROJECT No: 99751.01



REMARKS: HOLE DISCONTINUED DUE TO REFUSAL ON INFERRED WEATHERED ROCK; DUMMY CONE USED FROM 2.72m TO 3.25m DEPTH TO PENETRATE FILLINGHOLE COLLAPSE AT 2.7m DEPTH AFTER WITHRAWAL OF RODS

File: P:\99751.01 - CARSS PARK, 78 Carwar Ave, Geo\4.0 Field Work\4.2 Testing\CPTs\CPT203.CP5
Cone ID: 200310 **Type:** I-CFXYP20-10

ConePlot Version 5.9.2

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CONE PENETRATION TEST

CLIENT: SJB ARCHITECTS

PROJECT: CARSS PARK, 78 CARWAR AVE, GEO

LOCATION: KOGARAH WAR MEMORIAL POOL, CARSS PARK

REDUCED LEVEL: 3.2

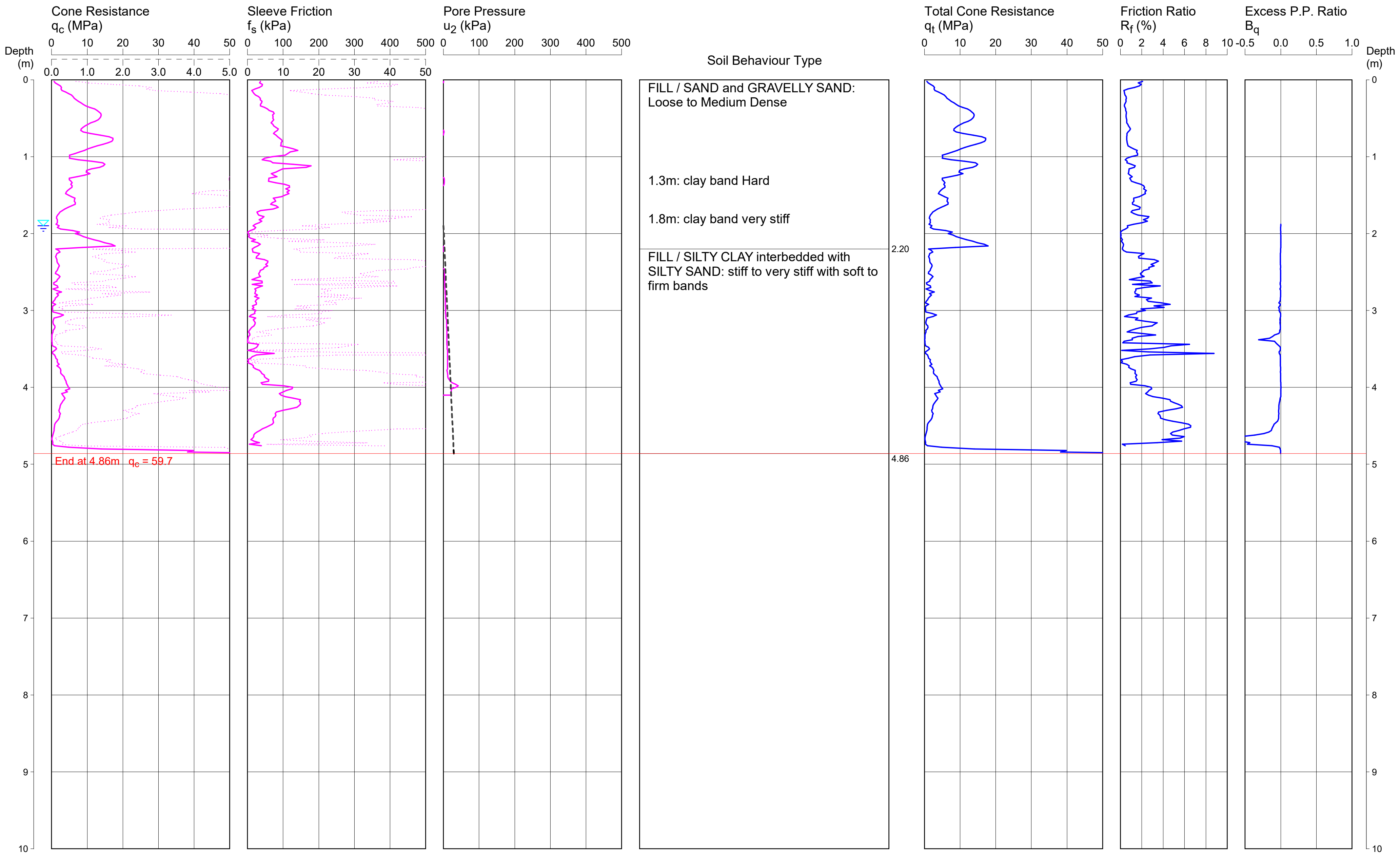
COORDINATES: 326393E 6237380N

CPT204

Page 1 of 1

DATE 30/07/2020

PROJECT No: 99751.01



REMARKS: HOLE DISCONTINUED DUE TO REFUSAL ON INFERRED WEATHERED ROCKGROUNDWATER OBSERVED AT 1.9m DEPTH AFTER WITHDRAWAL OF RODS

Water depth after test: 1.90m depth (measured)

File: P:\99751.01 - CARSS PARK, 78 Carwar Ave, Geo\4.0 Field Work\4.2 Testing\CPTs\CPT204.CP5

Cone ID: 200150 **Type:** I-CFXYP20-10

ConePlot Version 5.9.2

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CONE PENETRATION TEST

CLIENT: SJB ARCHITECTS

PROJECT: CARSS PARK, 78 CARWAR AVE, GEO

LOCATION: KOGARAH WAR MEMORIAL POOL, CARSS PARK

REDUCED LEVEL: 3.4

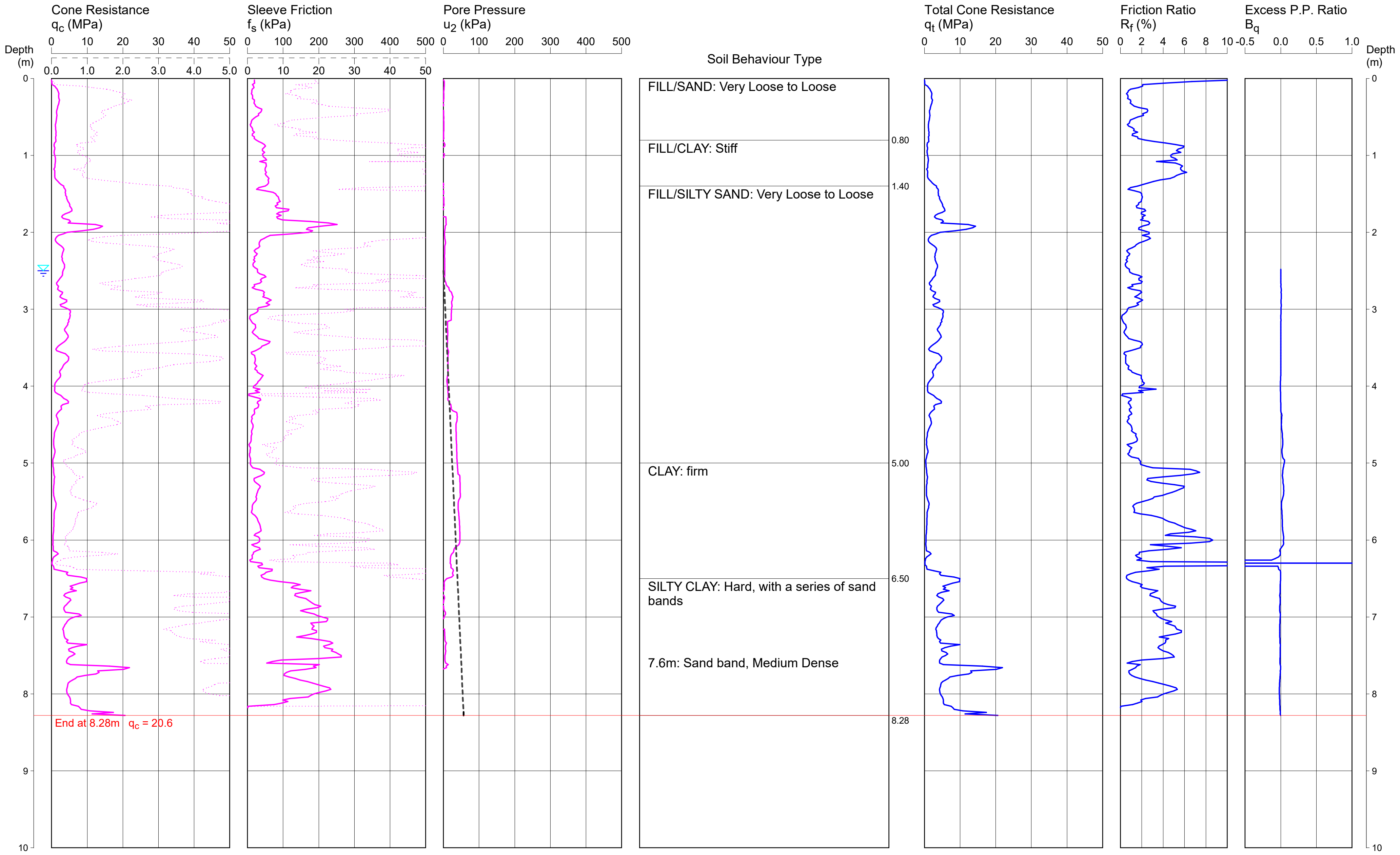
COORDINATES: 326419E 6237379N

CPT205

Page 1 of 1

DATE 28/07/2020

PROJECT No: 99751.01



REMARKS: HOLE DISCONTINUED DUE TO EXCESSIVE BENDING ON INFERRED WEATHERED ROCKGROUNDWATER OBSERVED AT 2.5m DEPTH AFTER WITHDRAWAL OF RODS

Water depth after test: 2.50m depth (measured)

File: P:\99751.01 - CARSS PARK, 78 Carwar Ave, Geo\4.0 Field Work\4.2 Testing\CPTs\CPT205.CP5
Cone ID: 200150 **Type:** I-CFXYP20-10

ConePlot Version 5.9.2

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CONE PENETRATION TEST

CLIENT: SJB ARCHITECTS

PROJECT: CARSS PARK, 78 CARWAR AVE, GEO

LOCATION: KOGARAH WAR MEMORIAL POOL, CARSS PARK

REDUCED LEVEL: 3.5

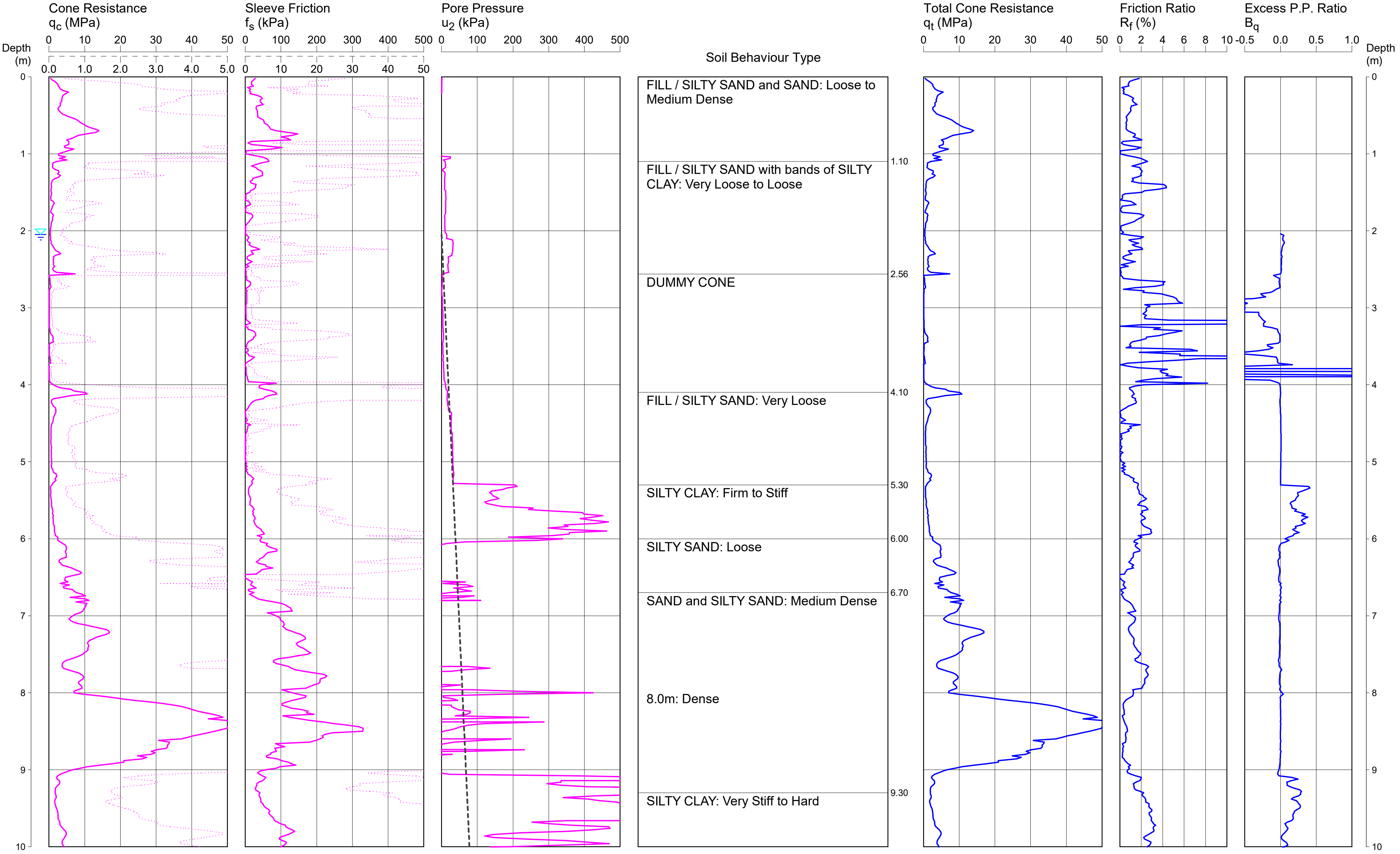
COORDINATES: 326419E 6237415N

CPT206

Page 1 of 2

DATE 28/07/2020

PROJECT No: 99751.01



REMARKS: HOLE DISCONTINUED DUE TO EXCESSIVE BENDING ON INFERRED WEATHERED ROCK; DUMMY CONE USED FROM 2.5m TO 4.1m DEPTH TO PENETRATE FILLING; GROUNDWATER OBSERVED AT 2.05m DEPTH AFTER WITHDRAWAL OF RODS

File: P:\99751.01 - CARSS PARK, 78 Carwar Ave, Geo\4.0 Field Work\4.2 Testing\CPTs\CPT206.CP5

Cone ID: 200319 **Type:** I-CFXY-10

Water depth after test: 2.05m depth (measured)

ConePlot Version 5.9.2

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CONE PENETRATION TEST

CLIENT: SJB ARCHITECTS

PROJECT: CARSS PARK, 78 CARWAR AVE, GEO

LOCATION: KOGARAH WAR MEMORIAL POOL, CARSS PARK

REDUCED LEVEL: 3.5

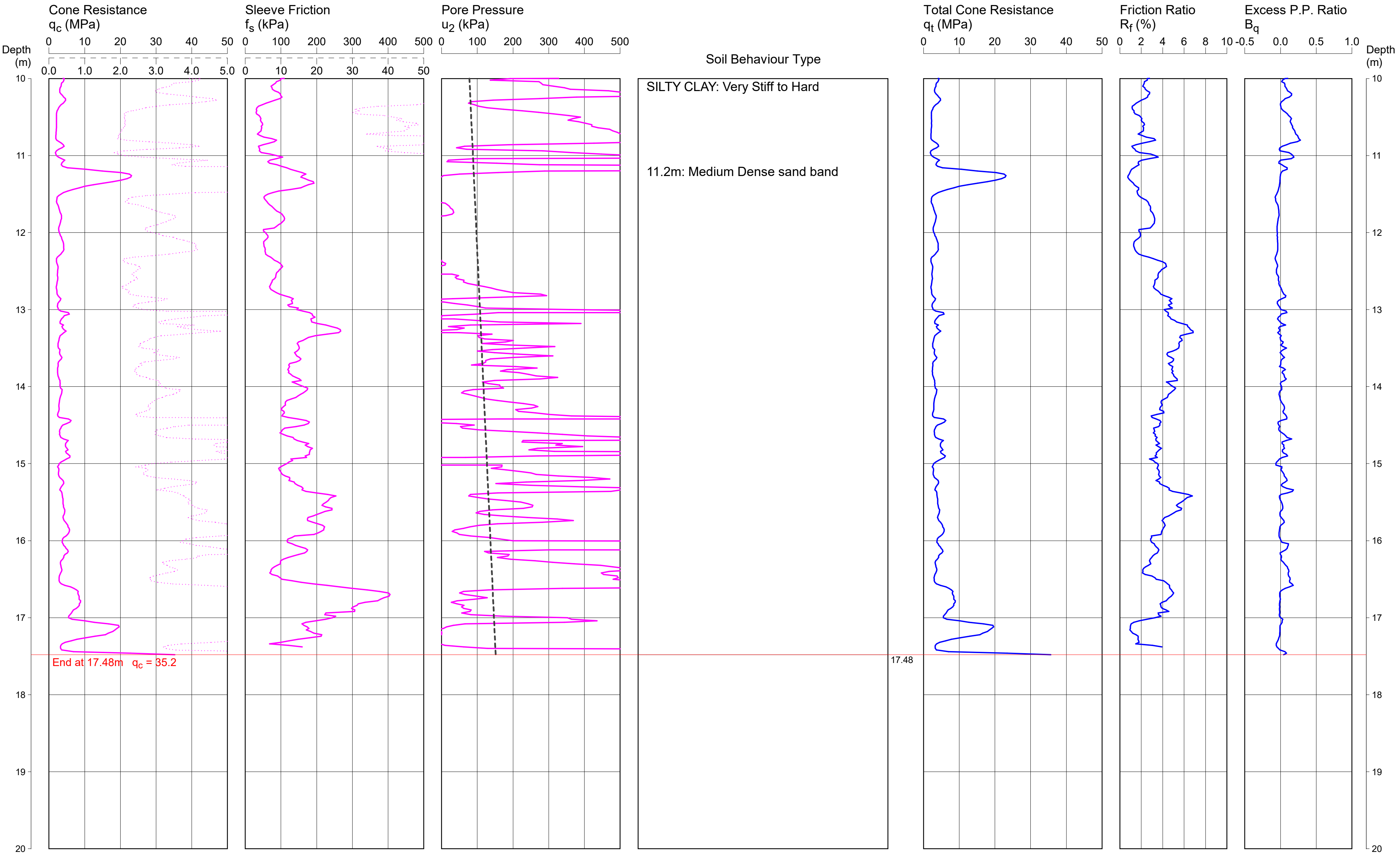
COORDINATES: 326419E 6237415N

CPT206

Page 2 of 2

DATE 28/07/2020

PROJECT No: 99751.01



REMARKS: HOLE DISCONTINUED DUE TO EXCESSIVE BENDING ON INFERRED WEATHERED ROCK; DUMMY CONE USED FROM 2.56m TO 4.1m DEPTH TO PENETRATE FILLING; GROUNDWATER OBSERVED AT 2.05m AFTER WITHDRAWAL OF RODS

Water depth after test: 2.05m depth (measured)

File: P:\99751.01 - CARSS PARK, 78 Carwar Ave, Geo\4.0 Field Work\4.2 Testing\CPTs\CPT206.CP5

Cone ID: 200310 **Type:** I-CFXYP20-10

ConePlot Version 5.9.2

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CONE PENETRATION TEST

CLIENT: SJB ARCHITECTS

PROJECT: CARSS PARK, 78 CARWAR AVE, GEO

LOCATION: KOGARAH WAR MEMORIAL POOL, CARSS PARK

REDUCED LEVEL: 4.1

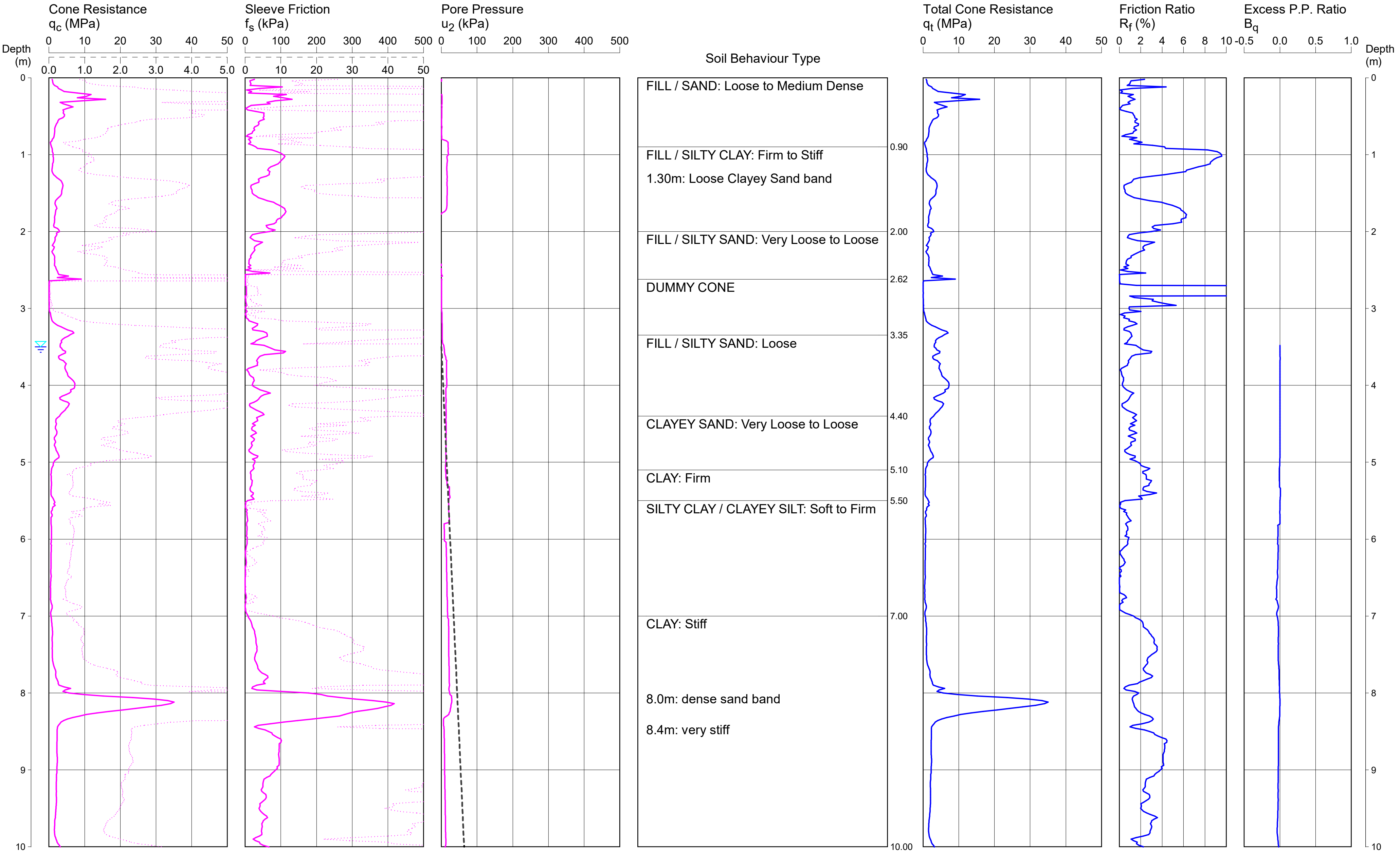
COORDINATES: 326423E 6237456N

CPT207

Page 1 of 4

DATE 29/07/2020

PROJECT No: 99751.01



REMARKS: HOLE DISCONTINUED DUE TO REFUSAL ON INFERRED WEATHERED ROCK; DUMMY CONE USED FROM 2.62m TO 3.35m DEPTH TO PENETRATE FILLINGGROUNDWATER OBSERVED AT 3.5m AFTER WITHDRAWAL OF RODS

Water depth after test: 3.50m depth (measured)

File: P:\99751.01 - CARSS PARK, 78 Carwar Ave, Geo\4.0 Field Work\4.2 Testing\CPTs\CPT207-STITCHED.CP5

Cone ID: 200309 **Type:** I-CFXYP20-10

ConePlot Version 5.9.2

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CONE PENETRATION TEST

CLIENT: SJB ARCHITECTS

PROJECT: CARSS PARK, 78 CARWAR AVE, GEO

LOCATION: KOGARAH WAR MEMORIAL POOL, CARSS PARK

REDUCED LEVEL: 4.1

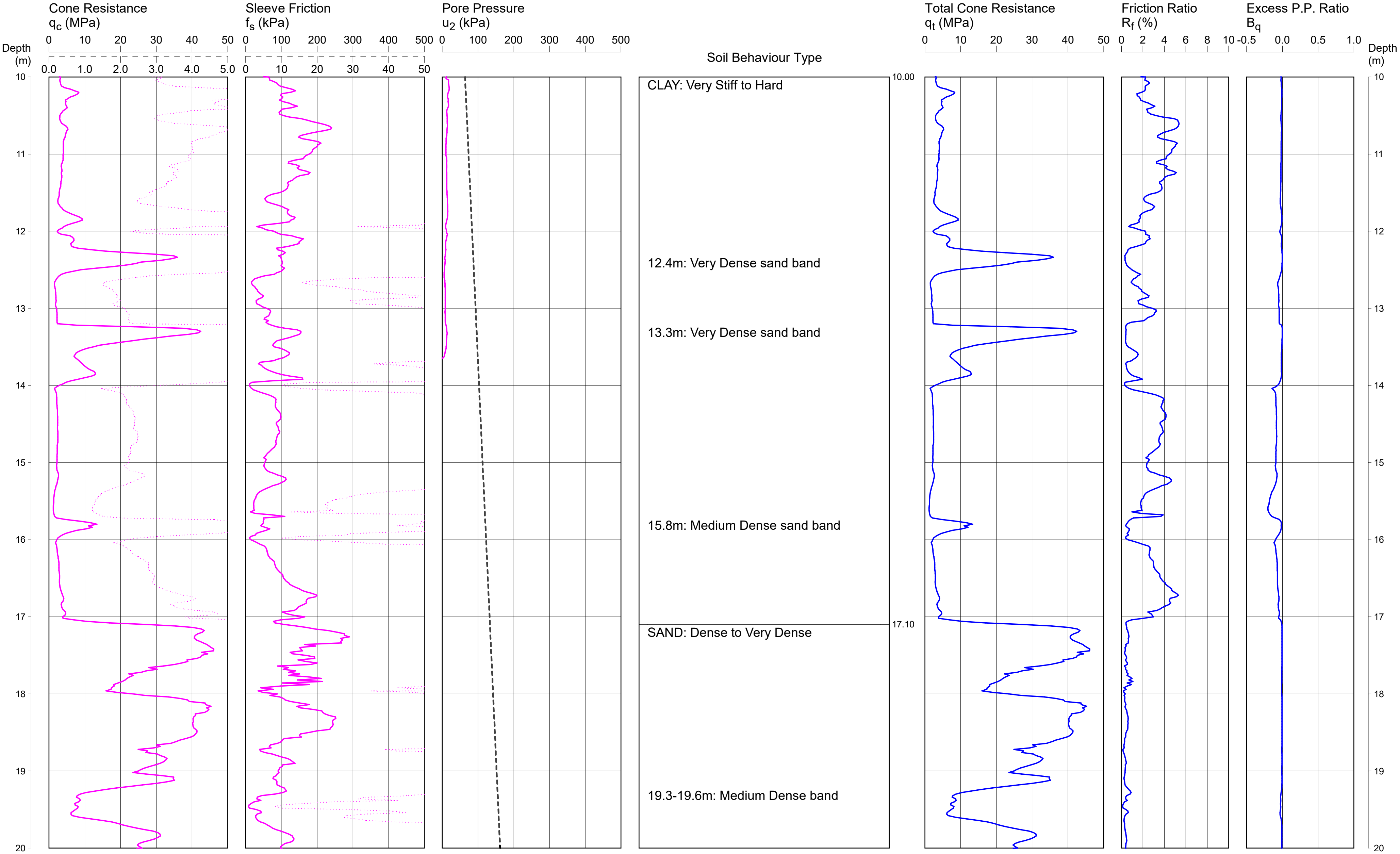
COORDINATES: 326423E 6237456N

CPT207

Page 2 of 4

DATE 29/07/2020

PROJECT No: 99751.01



REMARKS: HOLE DISCONTINUED DUE TO REFUSAL ON INFERRED WEATHERED ROCK; DUMMY CONE USED FROM 2.62m TO 3.35m DEPTH TO PENETRATE FILLINGGROUNDWATER OBSERVED AT 3.5m AFTER WITHDRAWAL OF RODS

Water depth after test: 3.50m depth (measured)

File: P:\99751.01 - CARSS PARK, 78 Carwar Ave, Geo\4.0 Field Work\4.2 Testing\CPTs\CPT207-STITCHED.CP5
Cone ID: 200309 **Type:** I-CFXYP20-10

ConePlot Version 5.9.2

Douglas Partners
Geotechnics | Environment | Groundwater

CONE PENETRATION TEST

CLIENT: SJB ARCHITECTS

PROJECT: CARSS PARK, 78 CARWAR AVE, GEO

LOCATION: KOGARAH WAR MEMORIAL POOL, CARSS PARK

REDUCED LEVEL: 4.1

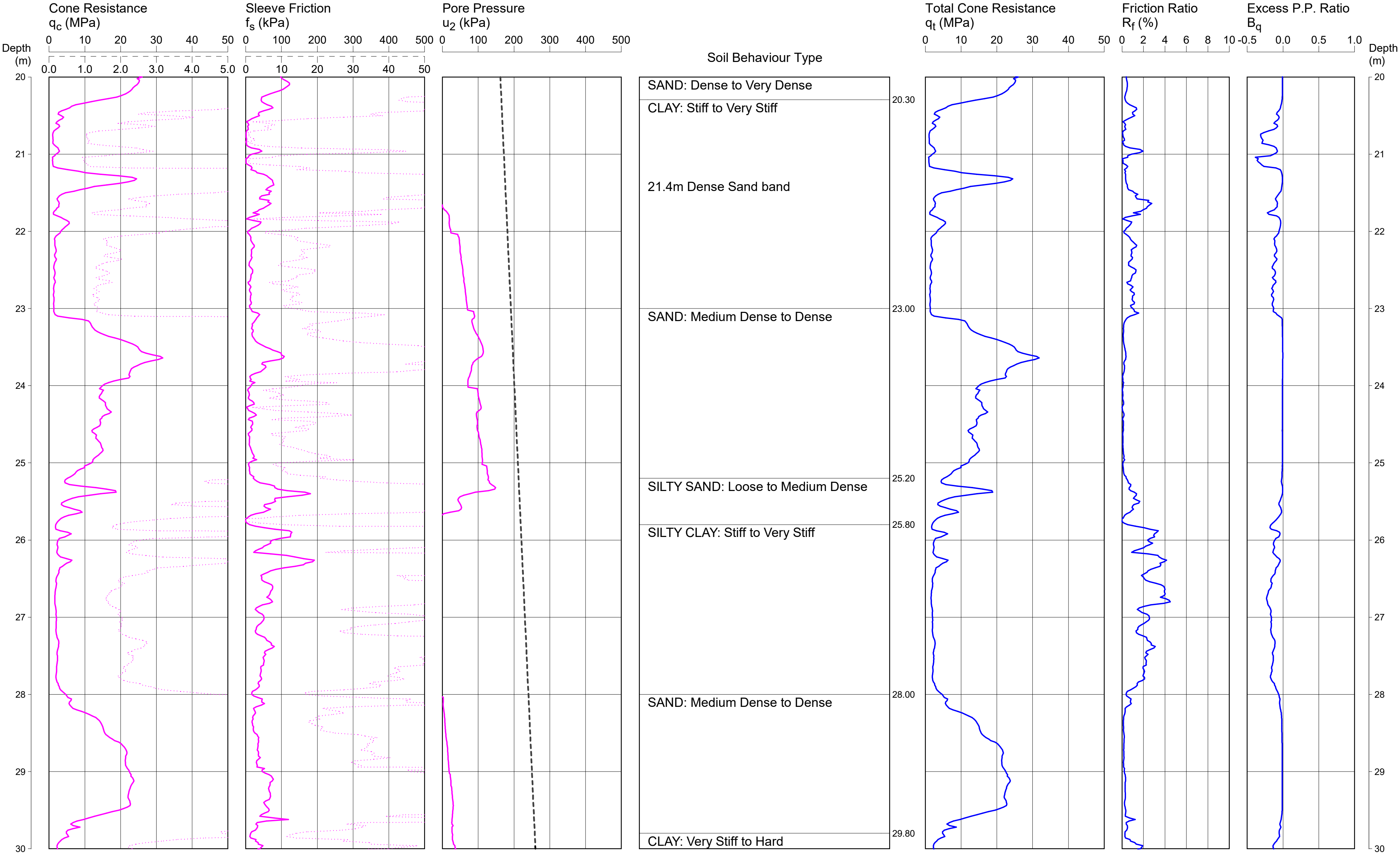
COORDINATES: 326423E 6237456N

CPT207

Page 3 of 4

DATE 29/07/2020

PROJECT No: 99751.01



REMARKS: HOLE DISCONTINUED DUE TO REFUSAL ON INFERRED WEATHERED ROCK; DUMMY CONE USED FROM 2.62m TO 3.35m DEPTH TO PENETRATE FILLINGGROUNDWATER OBSERVED AT 3.5m AFTER WITHDRAWAL OF RODS

Water depth after test: 3.50m depth (measured)

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Cone ID: 200309 **Type:** I-CFXYP20-10

ConePlot Version 5.9.2

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CONE PENETRATION TEST

CLIENT: SJB ARCHITECTS

PROJECT: CARSS PARK, 78 CARWAR AVE, GEO

LOCATION: KOGARAH WAR MEMORIAL POOL, CARSS PARK

REDUCED LEVEL: 4.1

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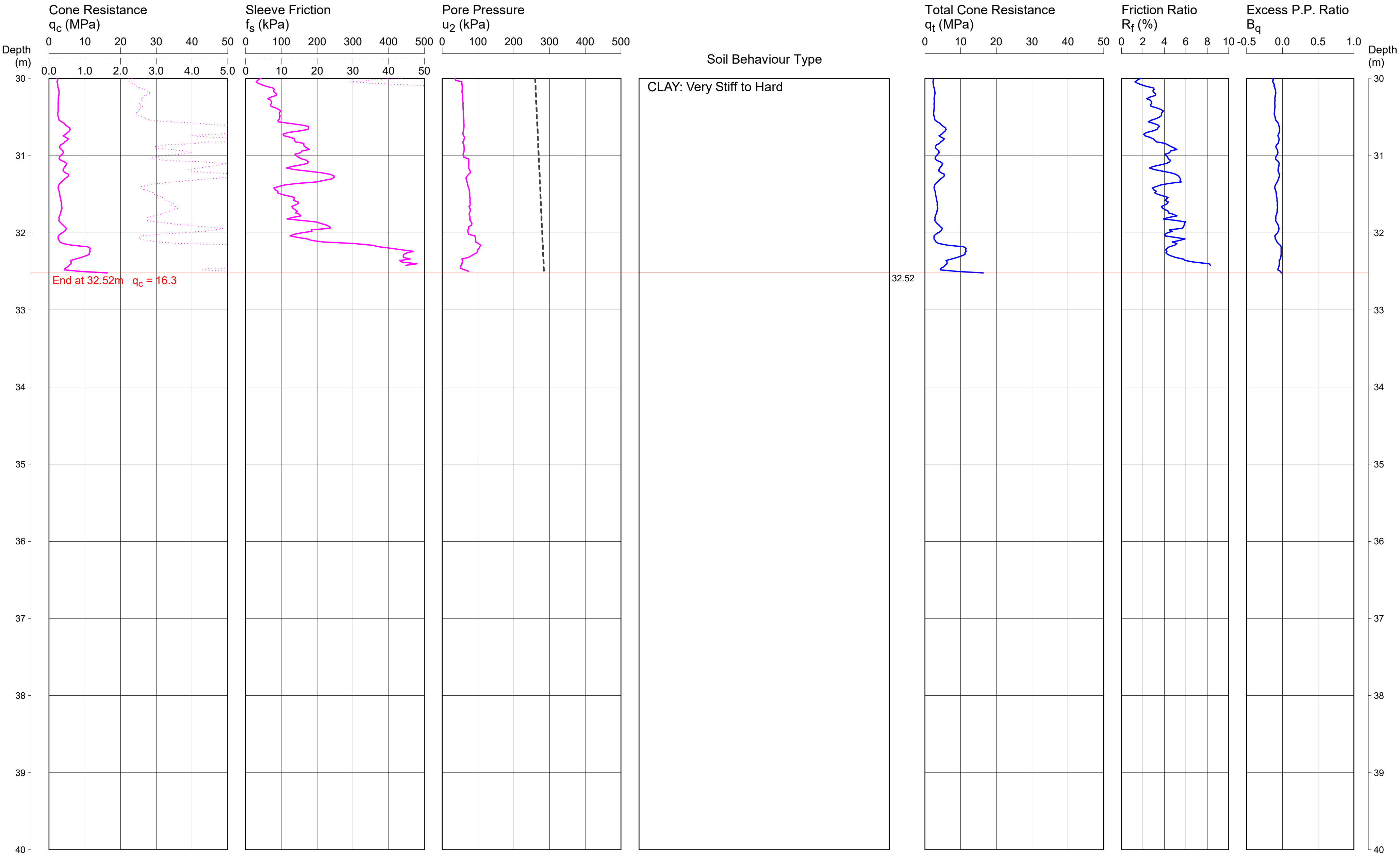
CPT207

Page 4 of 4

DATE 29/07/2020

PROJECT No: 99751.01



REMARKS: HOLE DISCONTINUED DUE TO REFUSAL ON INFERRED WEATHERED ROCK; DUMMY CONE USED FROM 2.62m TO 3.35m DEPTH TO PENETRATE FILLINGGROUNDWATER OBSERVED AT 3.5m AFTER WITHDRAWAL OF RODS

Water depth after test: 3.50m depth (measured)

File: P:\99751.01 - CARSS PARK, 78 Carwar Ave, Geo\4.0 Field Work\4.2 Testing\CPTs\CPT207-STITCHED.CP5

Cone ID: 200309 **Type:** I-CFXYP20-10

ConePlot Version 5.9.2

Douglas Partners
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CONE PENETRATION TEST

CLIENT: SJB ARCHITECTS

PROJECT: CARSS PARK, 78 CARWAR AVE, GEO

LOCATION: KOGARAH WAR MEMORIAL POOL, CARSS PARK

REDUCED LEVEL: 3.6

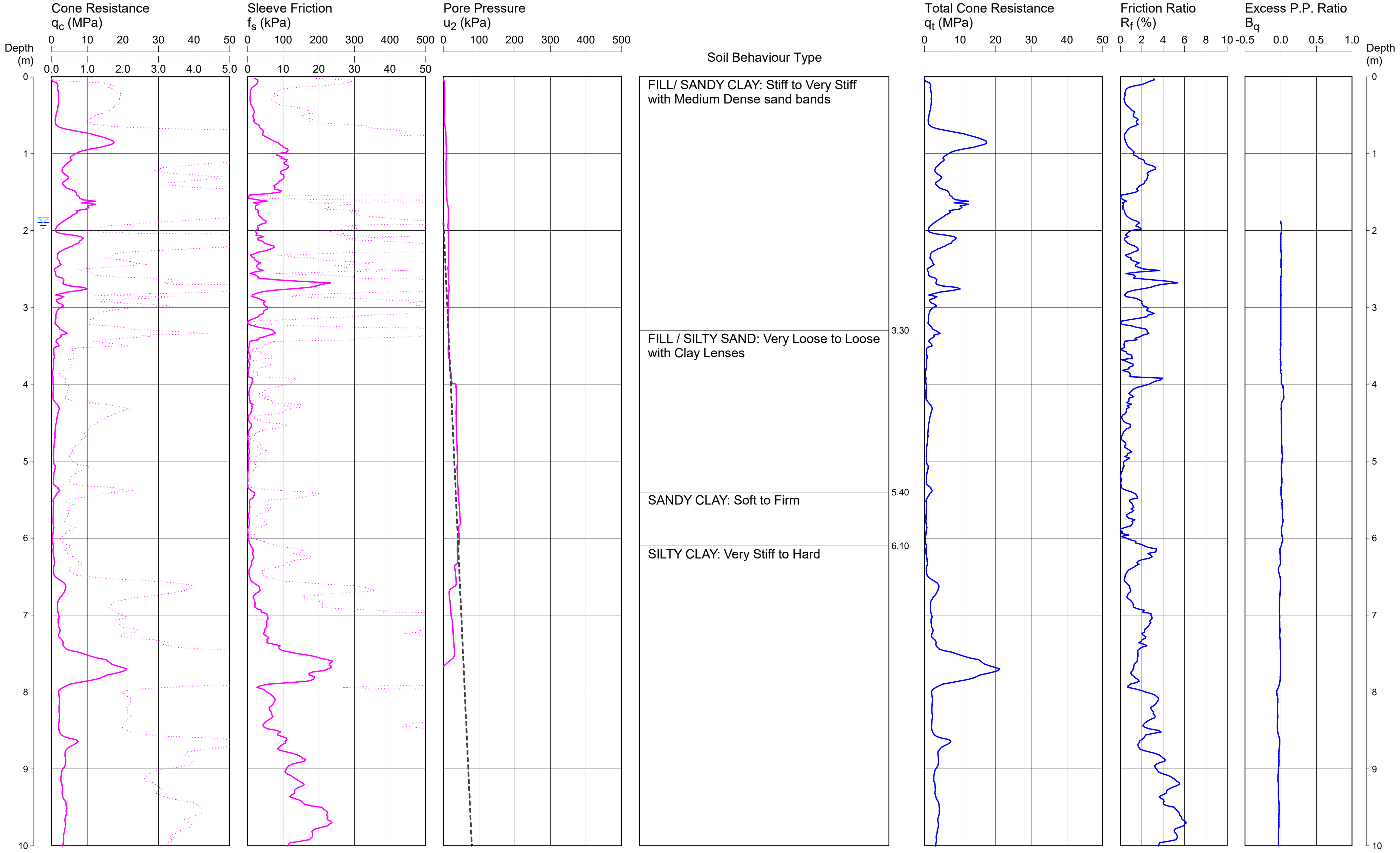
COORDINATES: 362393E 6237465N

CPT208

Page 1 of 2

DATE 29/07/2020

PROJECT No: 99751.01



FILL/ SANDY CLAY: Stiff to Very Stiff with Medium Dense sand bands

FILL / SILTY SAND: Very Loose to Loose with Clay Lenses

SANDY CLAY: Soft to Firm

SILTY CLAY: Very Stiff to Hard

REMARKS: HOLE DISCONTINUED DUE TO EXCESSIVE ROD BOWING IN INFERRED VERY DENSE SAND GROUNDWATER OBSERVED AT 1.9m DEPTH AFTER WITHDRAWAL OF RODS

Water depth after test: 1.90m depth (measured)

File: P:\99751.01 - CARSS PARK, 78 Carwar Ave, Geo\4.0 Field Work\4.2 Testing\CPTs\CPT208A-STITCHED.CP5
Cone ID: 200310 **Type:** I-CFXYP20-10

ConePlot Version 5.9.2

Douglas Partners
Geotechnics | Environment | Groundwater

CONE PENETRATION TEST

CLIENT: SJB ARCHITECTS

PROJECT: CARSS PARK, 78 CARWAR AVE, GEO

LOCATION: KOGARAH WAR MEMORIAL POOL, CARSS PARK

REDUCED LEVEL: 3.6

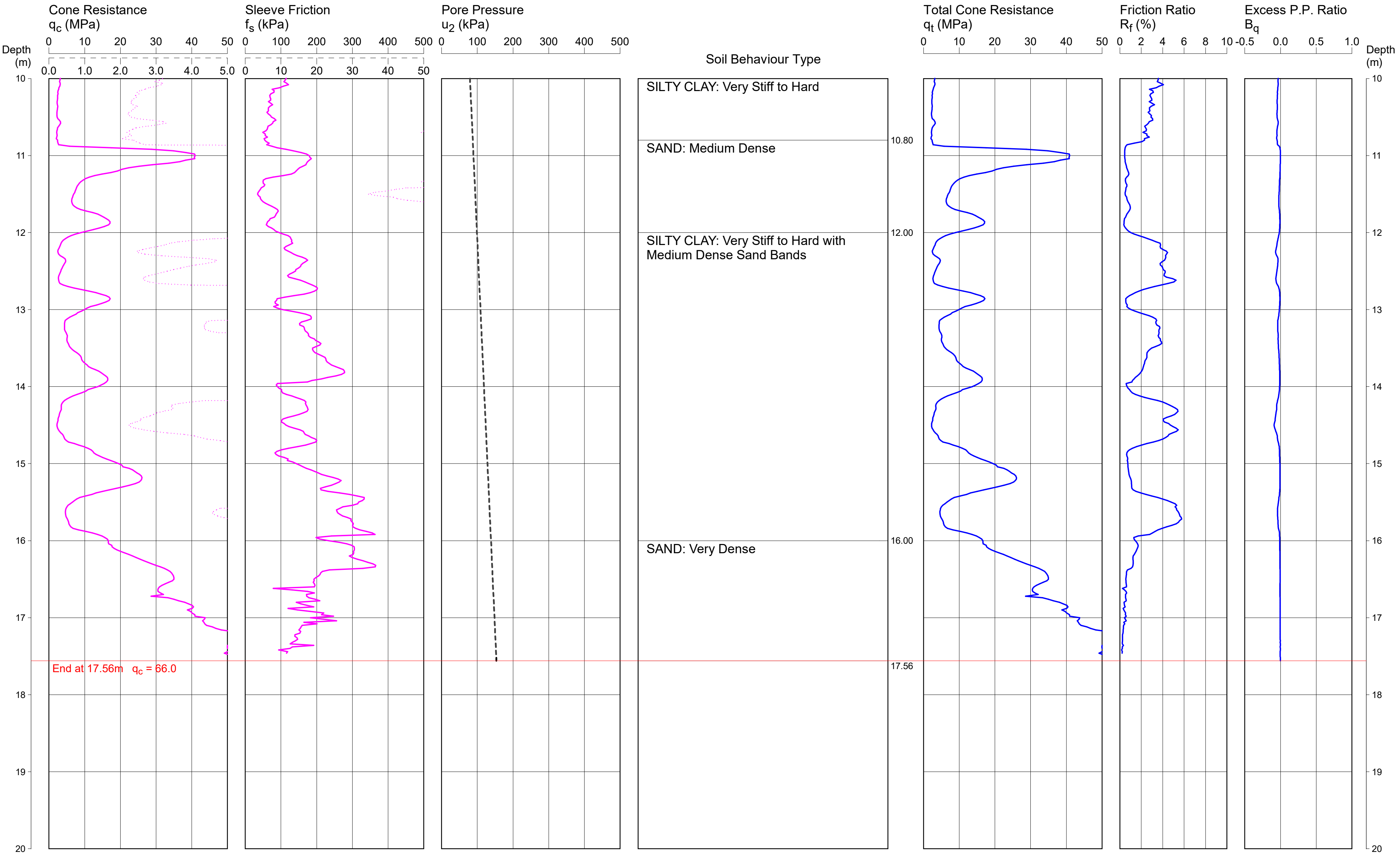
COORDINATES: 362393E 6237465N

CPT208

Page 2 of 2

DATE 29/07/2020

PROJECT No: 99751.01



REMARKS: HOLE DISCONTINUED DUE TO EXCESSIVE ROD BOWING IN INFERRED VERY DENSE SAND GROUNDWATER OBSERVED AT 1.9m DEPTH AFTER WITHDRAWAL OF RODS

Water depth after test: 1.90m depth (measured)

File: P:\99751.01 - CARSS PARK, 78 Carwar Ave, Geo\4.0 Field Work\4.2 Testing\CPTs\CPT208A-STITCHED.CP5
Cone ID: 200310 **Type:** I-CFXYP20-10

ConePlot Version 5.9.2

Douglas Partners
Geotechnics | Environment | Groundwater

Appendix D

Previous Field Work Results

Construction Sciences

BOREHOLE LOG SHEET

Client: Georges River Council
Project: Swimming Pool Redevelopment
Location: Carwar Avenue, Carss Park

Hole No: BH01

Job No: 5017200024
Sheet: 1 of 1

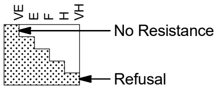
Position:	**Angle from Horizontal:** 90°	**Surface Elevation:**
Rig Type: Ute Mounted Drill Rig	**Mounting:** Ute	**Driller:** Mark
Casing Diameter:		**Contractor:**
Data Started: 8/8/19 **Date Completed:** 8/8/19	**Logged By:** LT	**Checked By:** VDS

Drilling				Sampling & Testing		Material Description					
Method	Resistance	Casing	Water	Sample or Field Test	Depth (m)	Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
AD/T	F		Not Encountered	D 0.00 - 0.20 m		⁘	SP	FILL: Silty SAND: fine grained, dark brown with roots 0.50m	D		FILL 0.00 m: TOPSOIL
				B 0.50 - 0.95 m SPT 0.50 - 0.95 m 5, 4, 3 N=7 D 0.80 - 0.95 m	1	▩	SP	FILL: Silty SAND: fine to coarse grained, light brown and dark brown, with fine to coarse grained ironstone and igneous gravel silt	D		0.50 m: FILL
				SPT 1.50 - 1.95 m 2, 0, 3 N=3 D 1.80 - 1.95 m	2	▩		2.50m	M		
				SPT 2.50 - 2.55 m 10/50mm N=R		▩		Sandstone, fine to coarse grained, light brown 3.00m			
					3			TERMINATED AT 3.00 m			3.00 m: Auger possibly refused on Sandstone boulder (Fill)
					4						
					5						
					6						
					7						
					8						
					9						

METHOD

EX	Excavator bucket
R	Ripper
HA	Hand auger
PT	Push tube
SON	Sonic drilling
AH	Air hammer
PS	Percussion sampler
AS	Short spiral auger
AD/V	Solid flight auger: V-Bit
AD/T	Solid flight auger: TC-Bit
HFA	Hollow flight auger
WB	Washbore drilling
RR	Rock roller

PENETRATION



WATER

- Water Level on Date shown
- water inflow
- water outflow

FIELD TESTS

SPT -	Standard Penetration Test
HP -	Hand/Pocket Penetrometer
DCP -	Dynamic Cone Penetrometer
PSP -	Perth Sand Penetrometer
MC -	Moisture Content
PBT -	Plate Bearing Test
IMP -	Borehole Impression Test
PID -	Phito Ionization Detector
VS -	Vane Shear; P=Peak, R=Resdual (uncorrected kPa)

SAMPLES

B -	Bulk disturbed sample
D -	Disturbed sample
ES -	Environmental sample
U -	Thin wall tube 'undisturbed'

MOISTURE

D -	Dry
M -	Moist
W -	Wet
PL -	Plastic limit
LL -	Liquid limit
w -	Moisture content

SOIL CONSISTENCY

VS -	Very Soft
S -	Soft
F -	Firm
St -	Stiff
VSt -	Very Stiff
H -	Hard

RELATIVE DENSITY

VL -	Very Loose
L -	Loose
MD -	Medium Dense
D -	Dense
VD -	Very Dense

Refer to explanatory notes for details of abbreviations and basis of descriptions

CONSTRUCTION SCIENCES

CS.GLB Log CARDNO NON-CORED 5017200024.GPJ <<DrawingFile>> 02/09/2019 11:33 10.0.000 Datgel AGS RTA, Photo, Monitoring Tools

Construction Sciences

BOREHOLE LOG SHEET

Client: Georges River Council
Project: Swimming Pool Redevelopment
Location: Carwar Avenue, Carss Park

Hole No: BH02

Job No: 5017200024
Sheet: 1 of 2

Position:
Angle from Horizontal: 90°
Surface Elevation:
Rig Type: Ute Mounted Drill Rig
Mounting: Ute
Driller: Daniel
Casing Diameter:
Contractor:
Data Started: 9/8/19
Date Completed: 9/8/19
Logged By: LT
Checked By: VDS

Method	Resistance	Casing	Water
AD/T	F		▶

Sampling & Testing

Sample or Field Test
D 0.00 - 0.10 m
D 0.40 - 0.50 m
B 0.50 - 0.80 m
SPT 0.50 - 0.95 m 7, 9, 8 N=17
D 0.80 - 0.95 m
SPT 1.50 - 1.95 m 5, 3, 3 N=6
D 1.80 - 1.95 m
SPT 2.50 - 2.95 m 2, 3, 5 N=8
D 2.80 - 2.95 m
D 3.50 m
SPT 3.50 - 3.95 m 1, 2, 2 N=4
SPT 4.50 - 4.95 m 1, 0, 0 N=0
SPT 6.00 - 6.45 m 2, 4, 4 N=8 PP 6.00 m =150 - 701 kPa
PP 7.15 m =150 - 170 kPa
SPT 7.50 - 7.95 m 3, 3, 7 N=10
SPT 9.00 - 9.45 m 7, 15, 13 N=28

Material Description

Depth (m)	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
0.00 - 0.40m	SM	Silty SAND: fine to medium grained, dark brown, with roots silt	D		0.00 m: TOPSOIL/FILL
0.40 - 3.30m	SC	Silty sandy Clay/ clayey Sand, medium plasticity,fine to coarse grained sand, dark brown, with igneous gravel, trace of plastic fragment	M (<PL)		FILL
3.30 - 6.00m	SC	Clayey SAND: fine to coarse grained, grey, with shell fragment clay	W	VL	MARINE
6.00 - 9.00m	SP-SC	Sandy CLAY: low plasticity, grey and orange brown, fine to coarse grained sand sand	M (>PL)	St	ALLUVIUM
9.00m -	SP-SC	Sandy CLAY: low plasticity, light grey, orange brown and red brown	M (<PL)	VSt - H	RESIDUAL SOIL

METHOD

EX	Excavator bucket
R	Ripper
HA	Hand auger
PT	Push tube
SON	Sonic drilling
AH	Air hammer
PS	Percussion sampler
AS	Short spiral auger
AD/V	Solid flight auger: V-Bit
AD/T	Solid flight auger: TC-Bit
HFA	Hollow flight auger
WB	Washbore drilling
RR	Rock roller

PENETRATION

VE E F H VH
No Resistance
Refusal

WATER

Water Level on Date shown
▶ water inflow
◀ water outflow

FIELD TESTS

SPT	- Standard Penetration Test
HP	- Hand/Pocket Penetrometer
DCP	- Dynamic Cone Penetrometer
PSP	- Perth Sand Penetrometer
MC	- Moisture Content
PBT	- Plate Bearing Test
IMP	- Borehole Impression Test
PID	- Phito Ionization Detector
VS	- Vane Shear; P=Peak, R=Resdual (uncorrected kPa)

SAMPLES

B	- Bulk disturbed sample
D	- Disturbed sample
ES	- Environmental sample
U	- Thin wall tube 'undisturbed'

MOISTURE

D	- Dry
M	- Moist
W	- Wet
PL	- Plastic limit
LL	- Liquid limit
w	- Moisture content

SOIL CONSISTENCY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard

RELATIVE DENSITY

VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

Refer to explanatory notes for details of abbreviations and basis of descriptions

CONSTRUCTION SCIENCES

Construction Sciences

BOREHOLE LOG SHEET

Client: Georges River Council
Project: Swimming Pool Redevelopment
Location: Carwar Avenue, Carss Park

Hole No: BH02

Job No: 5017200024
Sheet: 2 of 2

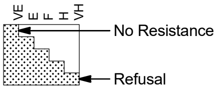
Position:	**Angle from Horizontal:** 90°	**Surface Elevation:**
Rig Type: Ute Mounted Drill Rig	**Mounting:** Ute	**Driller:** Daniel
Casing Diameter:		**Contractor:**
Data Started: 9/8/19 **Date Completed:** 9/8/19	**Logged By:** LT	**Checked By:** VDS

Drilling Method	Drilling Resistance	Drilling Casing	Water	Sampling & Testing Sample or Field Test	Depth (m)	Material Description Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
AD/T	F				11 12 13.00m	▨	SP-SC	Sandy CLAY: low plasticity, light grey, orange brown and red brown *(continued)*	M (<PL)	VSt - H	RESIDUAL SOIL
					13 13.50m	🟩		Sandstone, fine to medium grained, brown	W	VL	ROCK
					14 15 16 17 18 19			TERMINATED AT 13.50 m			

METHOD

EX	Excavator bucket
R	Ripper
HA	Hand auger
PT	Push tube
SON	Sonic drilling
AH	Air hammer
PS	Percussion sampler
AS	Short spiral auger
AD/V	Solid flight auger: V-Bit
AD/T	Solid flight auger: TC-Bit
HFA	Hollow flight auger
WB	Washbore drilling
RR	Rock roller

PENETRATION



WATER

- Water Level on Date shown
- ▶ water inflow
- ◀ water outflow

FIELD TESTS

SPT -	Standard Penetration Test
HP -	Hand/Pocket Penetrometer
DCP -	Dynamic Cone Penetrometer
PSP -	Perth Sand Penetrometer
MC -	Moisture Content
PBT -	Plate Bearing Test
IMP -	Borehole Impression Test
PID -	Phito Ionization Detector
VS -	Vane Shear; P=Peak, R=Resdual (uncorrected kPa)

SAMPLES

B -	Bulk disturbed sample
D -	Disturbed sample
ES -	Environmental sample
U -	Thin wall tube 'undisturbed'

MOISTURE

D -	Dry
M -	Moist
W -	Wet
PL -	Plastic limit
LL -	Liquid limit
w -	Moisture content

SOIL CONSISTENCY

VS -	Very Soft
S -	Soft
F -	Firm
St -	Stiff
VSt -	Very Stiff
H -	Hard

RELATIVE DENSITY

VL -	Very Loose
L -	Loose
MD -	Medium Dense
D -	Dense
VD -	Very Dense

Refer to explanatory notes for details of abbreviations and basis of descriptions

CONSTRUCTION SCIENCES

Construction Sciences

BOREHOLE LOG SHEET

Client: Georges River Council
Project: Swimming Pool Redevelopment
Location: Carwar Avenue, Carss Park

Hole No: BH03

Job No: 5017200024
Sheet: 1 of 2

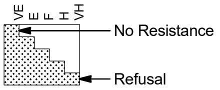
Position:
Angle from Horizontal: 90°
Surface Elevation:
Rig Type: Ute Mounted Drill Rig
Mounting: Ute
Driller: Mark
Casing Diameter:
Contractor:
Data Started: 9/8/19
Date Completed: 9/8/19
Logged By: LT
Checked By: VDS

Drilling				Sampling & Testing		Material Description					
Method	Resistance	Casing	Water	Sample or Field Test	Depth (m)	Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
AD/T	F			D 0.00 - 0.10 m SPT 0.50 - 0.95 m 6, 9, 0 N=9 D 0.80 - 0.95 m	1.50m		SP	Silty SAND: fine grained, dark brown and brown	D		0.00 m: TOPSOIL/FILL
				B 1.50 - 1.80 m SPT 1.50 - 1.95 m 4, 4, 12 N=16	1.80m		SP	FILL: Silty SAND: fine to coarse grained, dark brown and brown, with gravel silt			FILL
				D 1.80 - 1.95 m SPT 2.50 - 2.95 m 3, 4, 4 N=8 D 2.80 - 2.95 m	3.00m		SC	Low plasticity, FILL: Clayey SAND/Sandy CLAY: brown, with fine to coarse grained sand, with fine to coarse grained igneous gravel and metal wire and concrete gravel	M		2.50 m: High TC resistance between 2.5-3.0, seem concrete layer or gravel layer
			▶	B 3.50 - 3.95 m SPT 3.50 - 3.95 m 11, 2, 9 N=11 SPT 5.00 - 5.45 m 0, 0, 0 N=0	6.00m		SC	Clayey SAND: fine to coarse grained, dark grey, low plasticity clay clay	W	VS	MARINE
				PP 6.00 m =210 - 220 kPa SPT 6.50 - 6.95 m 5, 4, 4 N=8	7.50m		CI	Sandy Silty CLAY: medium plasticity, pale grey-orange brown and red brown, with fine to coarse grained gravel sand	M (<PL)	VSt	RESIDUAL SOIL
				SPT 8.00 - 8.45 m 3, 5, 6 N=11 PP 8.00 m =280 - 350 kPa SPT 9.50 - 9.95 m 3, 5, 9 N=14 PP 9.50 m =250 - 250 kPa			CI-CH	Silty CLAY: medium to high plasticity, grey	M (≈PL)	VSt	

METHOD

EX	Excavator bucket
R	Ripper
HA	Hand auger
PT	Push tube
SON	Sonic drilling
AH	Air hammer
PS	Percussion sampler
AS	Short spiral auger
AD/V	Solid flight auger: V-Bit
AD/T	Solid flight auger: TC-Bit
HFA	Hollow flight auger
WB	Washbore drilling
RR	Rock roller

PENETRATION



WATER

▽ Water Level on Date shown
▶ water inflow
◀ water outflow

FIELD TESTS

SPT -	Standard Penetration Test
HP -	Hand/Pocket Penetrometer
DCP -	Dynamic Cone Penetrometer
PSP -	Perth Sand Penetrometer
MC -	Moisture Content
PBT -	Plate Bearing Test
IMP -	Borehole Impression Test
PID -	Phito Ionization Detector
VS -	Vane Shear; P=Peak, R=Resdual (uncorrected kPa)

SAMPLES

B -	Bulk disturbed sample
D -	Disturbed sample
ES -	Environmental sample
U -	Thin wall tube 'undisturbed'

MOISTURE

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PL -	Plastic limit
LL -	Liquid limit
w -	Moisture content

SOIL CONSISTENCY

VS -	Very Soft
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RELATIVE DENSITY

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MD -	Medium Dense
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CONSTRUCTION SCIENCES

CS.GLB Log CARDNO NON-CORED 5017200024.GPJ <<DrawingFile>> 02/09/2019 11:33 10.0.000 Datgel AGS RTA, Photo, Monitoring Tools

BOREHOLE LOG SHEET

Construction Sciences

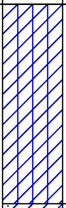
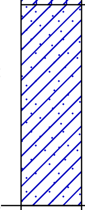
Client: Georges River Council
Project: Swimming Pool Redevelopment
Location: Carwar Avenue, Carss Park

Job No: 5017200024

Hole No: BH03

Sheet: 2 of 2

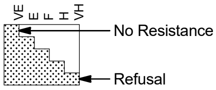
Position:	**Angle from Horizontal:** 90°	**Surface Elevation:**
Rig Type: Ute Mounted Drill Rig	**Mounting:** Ute	**Driller:** Mark
Casing Diameter:		**Contractor:**
Data Started: 9/8/19 **Date Completed:** 9/8/19	**Logged By:** LT	**Checked By:** VDS

Drilling				Sampling & Testing		Material Description					
Method	Resistance	Casing	Water	Sample or Field Test	Depth (m)	Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
AD/T	F				11		CI-CH	Silty CLAY: medium to high plasticity, grey *(continued)*	M (≈PL)	VSt	RESIDUAL SOIL
				SPT 12.50 - 12.95 m 4, 7, 7 N=14	12		SC	11.50m Sandy CLAY: medium plasticity, light grey, fine to coarse grained sand sand			
					13 14 15 16 17 18 19			13.00m TERMINATED AT 13.00 m			

METHOD

EX	Excavator bucket
R	Ripper
HA	Hand auger
PT	Push tube
SON	Sonic drilling
AH	Air hammer
PS	Percussion sampler
AS	Short spiral auger
AD/V	Solid flight auger: V-Bit
AD/T	Solid flight auger: TC-Bit
HFA	Hollow flight auger
WB	Washbore drilling
RR	Rock roller

PENETRATION



WATER

▽ Water Level on Date shown

► water inflow

◄ water outflow

FIELD TESTS

SPT	-	Standard Penetration Test
HP	-	Hand/Pocket Penetrometer
DCP	-	Dynamic Cone Penetrometer
PSP	-	Perth Sand Penetrometer
MC	-	Moisture Content
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IMP	-	Borehole Impression Test
PID	-	Phito Ionization Detector
VS	-	Vane Shear; P=Peak, R=Resdual (uncorrected kPa)

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SOIL CONSISTENCY

VS	-	Very Soft
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VSt	-	Very Stiff
H	-	Hard

RELATIVE DENSITY

VL	-	Very Loose
L	-	Loose
MD	-	Medium Dense
D	-	Dense
VD	-	Very Dense

Refer to explanatory notes for details of abbreviations and basis of descriptions

CONSTRUCTION SCIENCES

Construction Sciences

BOREHOLE LOG SHEET

Client: Georges River Council			**Hole No: BH04**
Project: Swimming Pool Redevelopment			
Location: Carwar Avenue, Carss Park		**Job No: 5017200024**	**Sheet: 1 of 2**
Position:		**Angle from Horizontal: 90°**	**Surface Elevation:**
Rig Type: Ute Mounted Drill Rig		**Mounting: Ute**	**Driller: Daniel**
Casing Diameter:			**Contractor:**
Data Started: 9/8/19	**Date Completed: 9/8/19**	**Logged By: LT**	**Checked By: VDS**

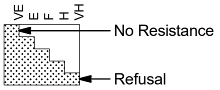
Drilling				Sampling & Testing		Material Description					
Method	Resistance	Casing	Water	Sample or Field Test	Depth (m)	Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
AD/T	F			D 0.00 - 0.10 m			SP	Silty SAND: fine to coarse grained, dark brown, with roots silt 0.40m	M		0.00 m: TOPSOIL/FILL
				D 0.40 - 0.50 m SPT 0.50 - 0.95 m 8, 9, 6 N=15 B 0.70 - 0.80 m			SP	FILL: SAND: fine to coarse grained, brown 0.70m	M (>PL)		FILL
				D 0.80 - 0.95 m SPT 1.50 - 1.95 m 6, 9, 6 N=15 D 1.80 - 1.95 m	1 2		CH	FILL: Silty CLAY: high plasticity, dark brown-red brown, with fine to coarse grained igneous gravel and sand silt 2.20m			
			▶	D 2.40 - 2.50 m SPT 2.50 - 2.95 m 10, 0, 0 N=0 D 2.90 - 3.00 m SPT 3.50 - 3.95 m 1, 0, 0 N=0 D 3.80 - 3.95 m	3 4		CL	FILL: Silty CLAY: low plasticity, dark grey, with roots, trace of metal and plastic sheets silt 4.50m			
				D 4.50 - 4.65 m SPT 4.50 - 4.95 m 0, 0, 0 N=0	5		SC	Sandy CLAY: low plasticity, dark grey, with shell fragments sand 5.50m	M (>PL)	St	MARINE
							CH	Silty CLAY: high plasticity, brown 6.00m	M (≈PL)	VSt	RESIDUAL SOIL
				SPT 6.00 - 6.45 m 2, 6, 9 N=15 PP 6.00 m =200 - 200 kPa	6		CH	Silty CLAY: high plasticity, grey 6.45m			
							SC	Sandy CLAY: medium plasticity, grey, fine to coarse grained sand sand 7.00m			
				PP 7.15 m =250 - 250 kPa SPT 7.50 - 7.95 m 2, 4, 8 N=12	7		CH	CLAY: high plasticity, grey 8.00m	M (<PL)	VSt	
				SPT 9.00 - 9.45 m 4, 4, 7 N=11	8 9		SC	Sandy CLAY: low to medium plasticity, grey, fine to medium grained sand sand	M (>PL)		

CS.GLB Log CARDNO NON-CORED 5017200024.GPJ <<DrawingFile>> 02/09/2019 11:33 10.0.000 Datgel AGS RTA, Photo, Monitoring Tools

METHOD

EX	Excavator bucket
R	Ripper
HA	Hand auger
PT	Push tube
SON	Sonic drilling
AH	Air hammer
PS	Percussion sampler
AS	Short spiral auger
AD/V	Solid flight auger: V-Bit
AD/T	Solid flight auger: TC-Bit
HFA	Hollow flight auger
WB	Washbore drilling
RR	Rock roller

PENETRATION



WATER

▽ Water Level on Date shown

▶ water inflow

◀ water outflow

FIELD TESTS

SPT	Standard Penetration Test
HP	Hand/Pocket Penetrometer
DCP	Dynamic Cone Penetrometer
PSP	Perth Sand Penetrometer
MC	Moisture Content
PBT	Plate Bearing Test
IMP	Borehole Impression Test
PID	Phito Ionization Detector
VS	Vane Shear; P=Peak, R=Resdual (uncorrected kPa)

SAMPLES

B	Bulk disturbed sample
D	Disturbed sample
ES	Environmental sample
U	Thin wall tube 'undisturbed'

MOISTURE

D	Dry
M	Moist
W	Wet
PL	Plastic limit
LL	Liquid limit
w	Moisture content

SOIL CONSISTENCY

VS	Very Soft
S	Soft
F	Firm
St	Stiff
VSt	Very Stiff
H	Hard

RELATIVE DENSITY

VL	Very Loose
L	Loose
MD	Medium Dense
D	Dense
VD	Very Dense

Refer to explanatory notes for details of abbreviations and basis of descriptions

CONSTRUCTION SCIENCES

Construction Sciences

BOREHOLE LOG SHEET

Client: Georges River Council
Project: Swimming Pool Redevelopment
Location: Carwar Avenue, Carss Park

Hole No: BH04

Job No: 5017200024
Sheet: 2 of 2

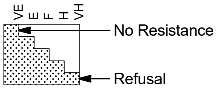
Position:	**Angle from Horizontal:** 90°	**Surface Elevation:**
Rig Type: Ute Mounted Drill Rig	**Mounting:** Ute	**Driller:** Daniel
Casing Diameter:		**Contractor:**
Data Started: 9/8/19 **Date Completed:** 9/8/19	**Logged By:** LT	**Checked By:** VDS

Drilling				Sampling & Testing		Material Description					
Method	Resistance	Casing	Water	Sample or Field Test	Depth (m)	Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
AD/T	F				11	▨	SC	Sandy CLAY: low to medium plasticity, grey, fine to medium grained sand sand *(continued)*	M (>PL)	VSt	RESIDUAL SOIL
				SPT 12.00 - 12.45 m 3, 7, 9 N=16	12	▨		12.45m	M (<PL)	H	
					13 14 15 16 17 18 19			TERMINATED AT 12.45 m			

METHOD

EX	Excavator bucket
R	Ripper
HA	Hand auger
PT	Push tube
SON	Sonic drilling
AH	Air hammer
PS	Percussion sampler
AS	Short spiral auger
AD/V	Solid flight auger: V-Bit
AD/T	Solid flight auger: TC-Bit
HFA	Hollow flight auger
WB	Washbore drilling
RR	Rock roller

PENETRATION



WATER

▽ Water Level on Date shown
▶ water inflow
◀ water outflow

FIELD TESTS

SPT -	Standard Penetration Test
HP -	Hand/Pocket Penetrometer
DCP -	Dynamic Cone Penetrometer
PSP -	Perth Sand Penetrometer
MC -	Moisture Content
PBT -	Plate Bearing Test
IMP -	Borehole Impression Test
PID -	Phito Ionization Detector
VS -	Vane Shear; P=Peak, R=Resdual (uncorrected kPa)

SAMPLES

B -	Bulk disturbed sample
D -	Disturbed sample
ES -	Environmental sample
U -	Thin wall tube 'undisturbed'

MOISTURE

D -	Dry
M -	Moist
W -	Wet
PL -	Plastic limit
LL -	Liquid limit
w -	Moisture content

SOIL CONSISTENCY

VS -	Very Soft
S -	Soft
F -	Firm
St -	Stiff
VSt -	Very Stiff
H -	Hard

RELATIVE DENSITY

VL -	Very Loose
L -	Loose
MD -	Medium Dense
D -	Dense
VD -	Very Dense

Refer to explanatory notes for details of abbreviations and basis of descriptions

CONSTRUCTION SCIENCES

Construction Sciences

BOREHOLE LOG SHEET

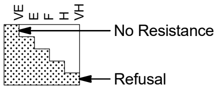
Client: Georges River Council			**Hole No: BH05**
Project: Swimming Pool Redevelopment			
Location: Carwar Avenue, Carss Park	**Job No: 5017200024**		**Sheet: 1 of 2**
Position:	**Angle from Horizontal: 90°**	**Surface Elevation:**	
Rig Type: Ute Mounted Drill Rig	**Mounting: Ute**	**Driller: Mark**	
Casing Diameter:		**Contractor:**	
Data Started: 9/8/19	**Date Completed: 9/8/19**	**Logged By: LT**	**Checked By: VDS**

Drilling				Sampling & Testing		Material Description					
Method	Resistance	Casing	Water	Sample or Field Test	Depth (m)	Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
AD/T	F			D 0.00 - 0.10 m D 0.40 - 0.50 m SPT 0.50 - 0.95 m 2, 2, 2 N=4			SM	Silty SAND: fine to medium grained, dark brown, with roots and clay silt 0.80m	M		0.00 m: TOPSOIL/FILL
				D 0.80 - 0.95 m	1		SC	FILL: Sandy CLAY: low plasticity, dark grey, fine to coarse grained sand, trace of glass fragment sand 1.50m	M (>PL)		FILL
			▶	SPT 1.50 - 1.95 m 1, 2, 1 N=3 D 1.90 - 2.00 m	2		SC	FILL: CLAY: low plasticity, dark grey, with plastic sheets, rags and metal fragments 2.50m			
				B 2.50 - 2.80 m SPT 2.50 - 2.95 m 1, 0, 1 N=1			SP	SAND: fine to coarse grained, dark grey, with shale fragments 2.80m	W	VL	MARINE
				2.80 - 2.95 m SPT 3.50 - 3.95 m 1, 1, 1 N=2	3		CL	Silty CLAY: low plasticity, dark grey, with fine grained sand shell fragment silt 3.80m	M (>PL)	VS	
				SPT 5.00 - 5.45 m 5, 8, 7 N=15	4 5		SP	SAND: fine to coarse grained, dark grey 5.15m	W	VL	
					6		SP	SAND: fine to coarse grained, pale grey mottled yellow brown with clay 6.50m		MD	
				SPT 7.00 - 7.45 m 5, 10, 12 N=22	7 8		SC	Clayey SAND: fine to medium grained, grey, low plasticity clay clay 9.00m			
				SPT 9.00 - 9.45 m 4, 7, 10 N=17 PP 9.00 m =300 - 310 kPa	9		CL	Silty CLAY: low plasticity, grey	M (<PL)	VSt	

METHOD

EX	Excavator bucket
R	Ripper
HA	Hand auger
PT	Push tube
SON	Sonic drilling
AH	Air hammer
PS	Percussion sampler
AS	Short spiral auger
AD/V	Solid flight auger: V-Bit
AD/T	Solid flight auger: TC-Bit
HFA	Hollow flight auger
WB	Washbore drilling
RR	Rock roller

PENETRATION



WATER

- Water Level on Date shown
- ▶ water inflow
- ◀ water outflow

FIELD TESTS

SPT -	Standard Penetration Test
HP -	Hand/Pocket Penetrometer
DCP -	Dynamic Cone Penetrometer
PSP -	Perth Sand Penetrometer
MC -	Moisture Content
PBT -	Plate Bearing Test
IMP -	Borehole Impression Test
PID -	Phito Ionization Detector
VS -	Vane Shear; P=Peak, R=Resdual (uncorrected kPa)

SAMPLES

B -	Bulk disturbed sample
D -	Disturbed sample
ES -	Environmental sample
U -	Thin wall tube 'undisturbed'

MOISTURE

D -	Dry
M -	Moist
W -	Wet
PL -	Plastic limit
LL -	Liquid limit
w -	Moisture content

SOIL CONSISTENCY

VS -	Very Soft
S -	Soft
F -	Firm
St -	Stiff
VSt -	Very Stiff
H -	Hard

RELATIVE DENSITY

VL -	Very Loose
L -	Loose
MD -	Medium Dense
D -	Dense
VD -	Very Dense

Refer to explanatory notes for details of abbreviations and basis of descriptions

CONSTRUCTION SCIENCES

CS.GLB Log CARDNO NON-CORED 5017200024.GPJ <<DrawingFile>> 02/09/2019 11:33 10.0.000 Datgel AGS RTA, Photo, Monitoring Tools

BOREHOLE LOG SHEET

Client: Georges River Council
Project: Swimming Pool Redevelopment
Location: Carwar Avenue, Carss Park

Hole No: BH05

Job No: 5017200024
Sheet: 2 of 2

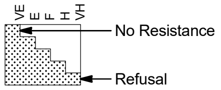
Position:	**Angle from Horizontal:** 90°	**Surface Elevation:**
Rig Type: Ute Mounted Drill Rig	**Mounting:** Ute	**Driller:** Mark
Casing Diameter:		**Contractor:**
Data Started: 9/8/19 **Date Completed:** 9/8/19	**Logged By:** LT	**Checked By:** VDS

Drilling				Sampling & Testing		Material Description					
Method	Resistance	Casing	Water	Sample or Field Test	Depth (m)	Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
AD/T	F				11 12 13	▨	CL	Silty CLAY: low plasticity, grey *(continued)* 13.50m	M (<PL)	VSt	MARINE 13.00 m: Weathered Rock cutting recovered on Auger
					14 15 16 17 18 19			TERMINATED AT 13.50 m			

METHOD

EX	Excavator bucket
R	Ripper
HA	Hand auger
PT	Push tube
SON	Sonic drilling
AH	Air hammer
PS	Percussion sampler
AS	Short spiral auger
AD/V	Solid flight auger: V-Bit
AD/T	Solid flight auger: TC-Bit
HFA	Hollow flight auger
WB	Washbore drilling
RR	Rock roller

PENETRATION



WATER

▽	Water Level on Date shown
▶	water inflow
◀	water outflow

FIELD TESTS

SPT	Standard Penetration Test
HP	Hand/Pocket Penetrometer
DCP	Dynamic Cone Penetrometer
PSP	Perth Sand Penetrometer
MC	Moisture Content
PBT	Plate Bearing Test
IMP	Borehole Impression Test
PID	Phito Ionization Detector
VS	Vane Shear; P=Peak, R=Resdual (uncorrected kPa)

SAMPLES

B	Bulk disturbed sample
D	Disturbed sample
ES	Environmental sample
U	Thin wall tube 'undisturbed'

MOISTURE

D	Dry
M	Moist
W	Wet
PL	Plastic limit
LL	Liquid limit
w	Moisture content

SOIL CONSISTENCY

VS	Very Soft
S	Soft
F	Firm
St	Stiff
VSt	Very Stiff
H	Hard

RELATIVE DENSITY

VL	Very Loose
L	Loose
MD	Medium Dense
D	Dense
VD	Very Dense

Refer to explanatory notes for details of abbreviations and basis of descriptions

Construction Sciences

BOREHOLE LOG SHEET

Client: Georges River Council
Project: Swimming Pool Redevelopment
Location: Carwar Avenue, Carss Park
Job No: 5017200024
Hole No: BH06
Sheet: 1 of 1

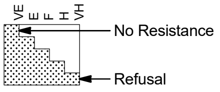
Position:	**Angle from Horizontal:** 90°	**Surface Elevation:**
Rig Type: Ute Mounted Drill Rig	**Mounting:** Ute	**Driller:** Mark
Casing Diameter:		**Contractor:**
Data Started: 9/8/19 **Date Completed:** 9/8/19	**Logged By:** LT	**Checked By:** VDS

Drilling				Sampling & Testing		Material Description					
Method	Resistance	Casing	Water	Sample or Field Test	Depth (m)	Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
AD/T	F				0.05m	■		ASPHALT			FILL 0.00 m: Asphalt
				D 0.40 - 0.50 m SPT 0.50 - 0.95 m 4, 2, 2 N=4	0.80m	▦	SP	FILL: SAND: fine to coarse grained, dark grey	D		0.50 m: Road Base
				D 0.80 - 0.95 m	1.50m	▩	SC	FILL: Sandy CLAY: low to medium plasticity, brown and dark grey, fine to medium grained sand sand	M (>PL)		
			▶	SPT 1.50 - 1.95 m 1, 0, 2 N=2 D 1.80 - 1.95 m SPT 2.50 - 2.95 m 1, 0, 0 N=0 SPT 3.50 - 3.95 m 3, 4, 0 N=4 D 3.80 - 3.95 m	4.50m	▩		Sandy CLAY/ Clayey SAND, brown and dark brown, low to medium plasticity, fine to coarse grained, trace of glass fragment, a piece of metal wire and timber fragments and rags	M (>PL)		
				SPT 4.50 - 4.95 m 2, 3, 7 N=10 D 4.80 - 4.95 m SPT 6.00 - 6.32 m 5, 7, 4/20mm N=R	6.30m	▨		Sandy CLAY: low plasticity, light grey and red brown, fine to coarse grained, with fine to coarse grained gravel sand	M (<PL)	St - VSt	RESIDUAL SOIL
					7.00m	🟩		SANDSTONE: fine to coarse grained, palegrey	W	VL	ROCK
								TERMINATED AT 7.00 m			7.00 m: Auger refusal

METHOD

EX	Excavator bucket
R	Ripper
HA	Hand auger
PT	Push tube
SON	Sonic drilling
AH	Air hammer
PS	Percussion sampler
AS	Short spiral auger
AD/V	Solid flight auger: V-Bit
AD/T	Solid flight auger: TC-Bit
HFA	Hollow flight auger
WB	Washbore drilling
RR	Rock roller

PENETRATION



WATER

▽	Water Level on Date shown
▶	water inflow
◀	water outflow

FIELD TESTS

SPT	Standard Penetration Test
HP	Hand/Pocket Penetrometer
DCP	Dynamic Cone Penetrometer
PSP	Perth Sand Penetrometer
MC	Moisture Content
PBT	Plate Bearing Test
IMP	Borehole Impression Test
PID	Phito Ionization Detector
VS	Vane Shear; P=Peak, R=Resdual (uncorrected kPa)

SAMPLES

B	Bulk disturbed sample
D	Disturbed sample
ES	Environmental sample
U	Thin wall tube 'undisturbed'

MOISTURE

D	Dry
M	Moist
W	Wet
PL	Plastic limit
LL	Liquid limit
w	Moisture content

SOIL CONSISTENCY

VS	Very Soft
S	Soft
F	Firm
St	Stiff
VSt	Very Stiff
H	Hard

RELATIVE DENSITY

VL	Very Loose
L	Loose
MD	Medium Dense
D	Dense
VD	Very Dense

Refer to explanatory notes for details of abbreviations and basis of descriptions

CONSTRUCTION SCIENCES

CS.GLB Log CARDNO NON-CORED 5017200024.GPJ <<DrawingFile>> 02/09/2019 11:34 10.0.000 Datgel AGS RTA, Photo, Monitoring Tools

Appendix E

Dissipation Test Results

DISSIPATION TEST

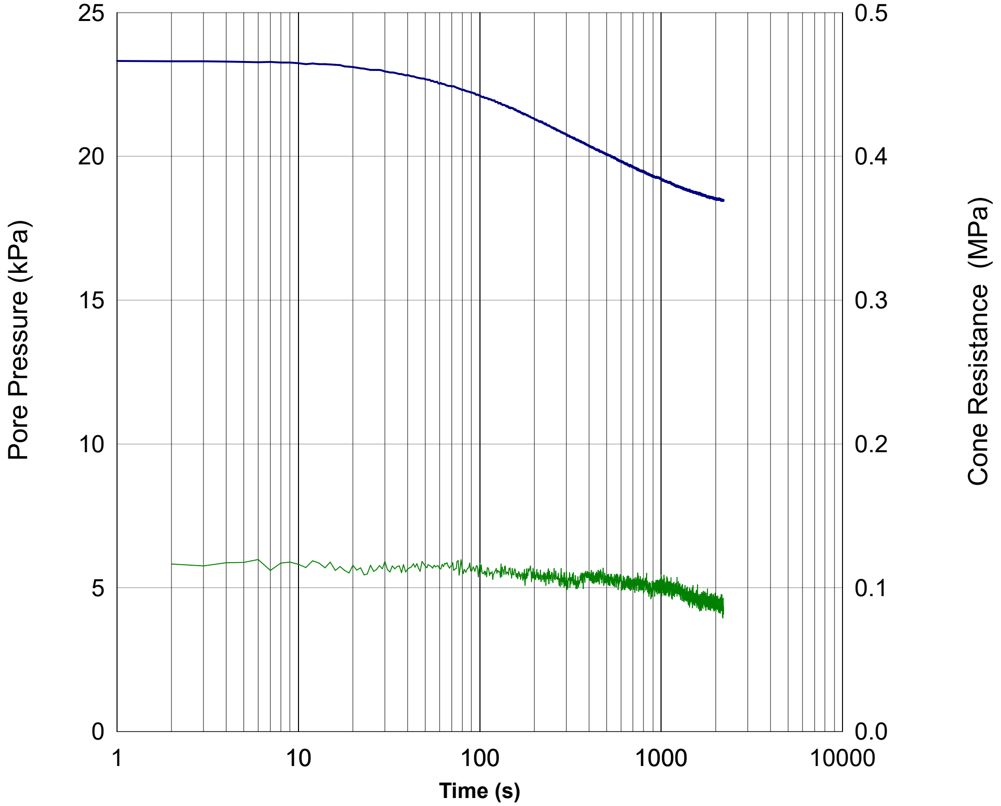
CLIENT SJB ARCHITECTS

PROJECT CARRS PARK, 78 CARWAR AVE, GEO
LOCATION KOGARAH WAR MEMORIAL POOL, CARSS PARK
PROJECT No 99751.01

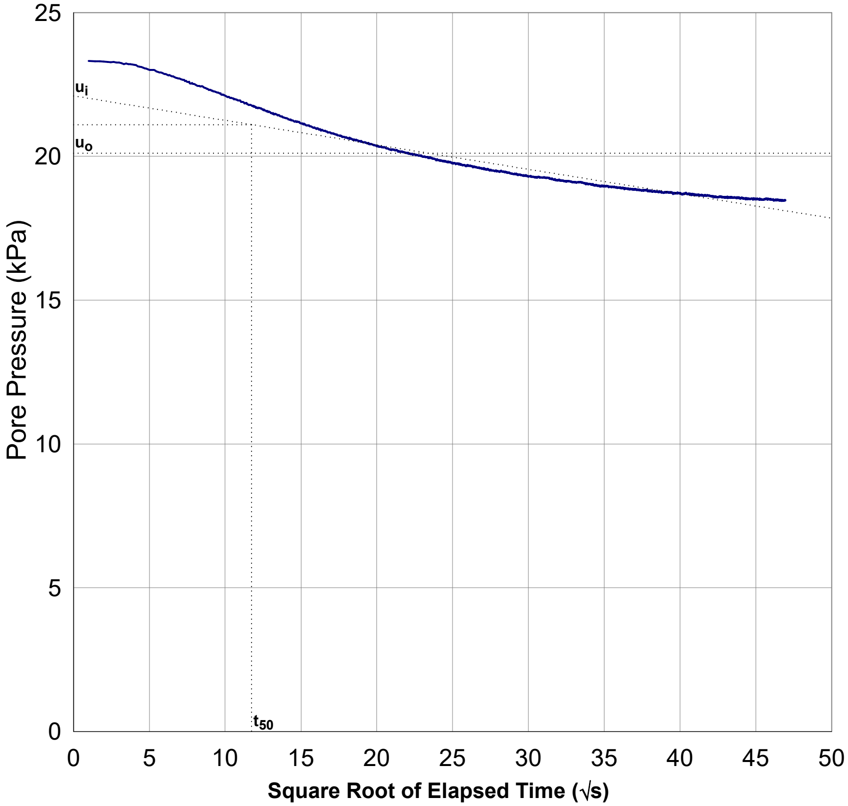
CPT201

DEPTH 3.5m
DATE 28/07/2020

PORE PRESSURE / CONE RESISTANCE



ROOT-TIME GRAPH



Water Level after test:	1.45	
Estimated hydrostatic pore pressure (u_0):	20.1	**kPa**
Estimated Initial Pore Pressure (u_i):	22.1	**kPa**
Final Measured Pore Pressure:	18.5	**kPa**
Time for 50% pore pressure reduction (t_{50}):	138	**seconds**
	2.3	**minutes**

c_h:	148	**m²/year**
Location of Filter Element:	2 (behind tip)	
Diameter of Cone:	35.7	**mm**

Reference: 'EVALUATION OF FIELD CPTU DISSIPATION DATA IN OVERCONSOLIDATED FINE-GRAINED SOILS'
J.P. Sully, R.G. Campanella XIII ICSMFE, 1994 New Delhi, India

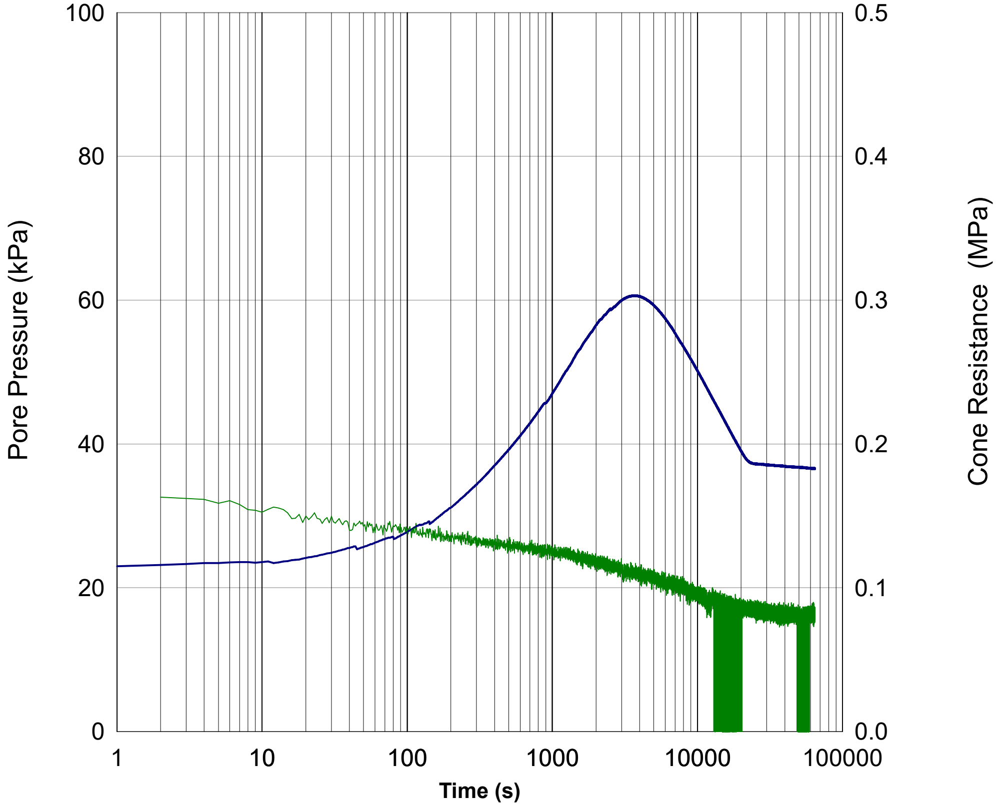
REMARKS:

File: CPT201.T03
Cone ID: 200150 **Type:** I-CFXYP20-10

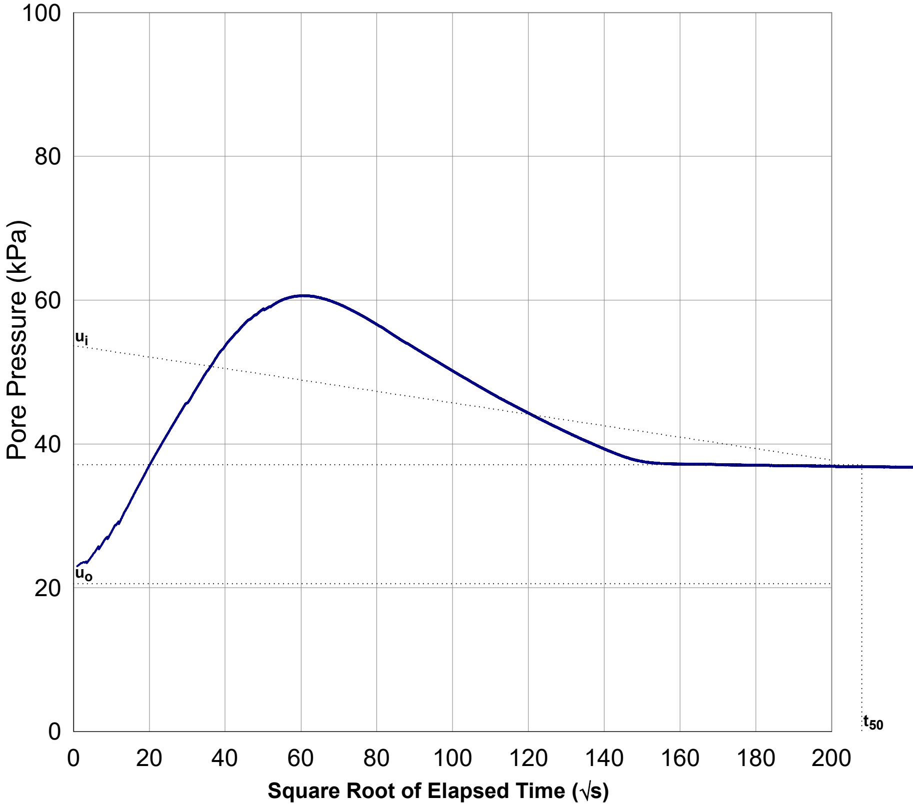
Date	
Plotted	
Checked	

DISSIPATION TEST	**PROJECT** CARRS PARK, 78 CARWAR AVE, GEO		**CPT208A**
CLIENT SJB ARCHITECTS	**LOCATION** KOGARAH WAR MEMORIAL POOL, CARSS PARK		**DEPTH 4.0m**
	PROJECT No 99751.01		**DATE** 29/07/2020

PORE PRESSURE / CONE RESISTANCE



ROOT-TIME GRAPH



Water Level after test:	1.9	
Estimated hydrostatic pore pressure (u_0):	20.6	**kPa**
Estimated Initial Pore Pressure (u_i):	53.7	**kPa**
Final Measured Pore Pressure:	36.6	**kPa**
Time for 50% pore pressure reduction (t_{50}):	43229	**seconds**
	720.5	**minutes**

c_h:	0	**m²/year**
Location of Filter Element:	2 (behind tip)	
Diameter of Cone:	35.7	**mm**

Reference: 'EVALUATION OF FIELD CPTU DISSIPATION DATA IN OVERCONSOLIDATED FINE-GRAINED SOILS'
J.P. Sully, R.G. Campanella XIII ICSMFE, 1994 New Delhi, India

REMARKS:

File: CPT208A-STITCHED.T02
Cone ID: 200310 **Type:** I-CFXYP20-10

Date
Plotted
Checked

DISSIPATION TEST

CLIENT SJB ARCHITECTS

PROJECT CARRS PARK, 78 CARWAR AVE, GEO

LOCATION KOGARAH WAR MEMORIAL POOL, CARSS PARK

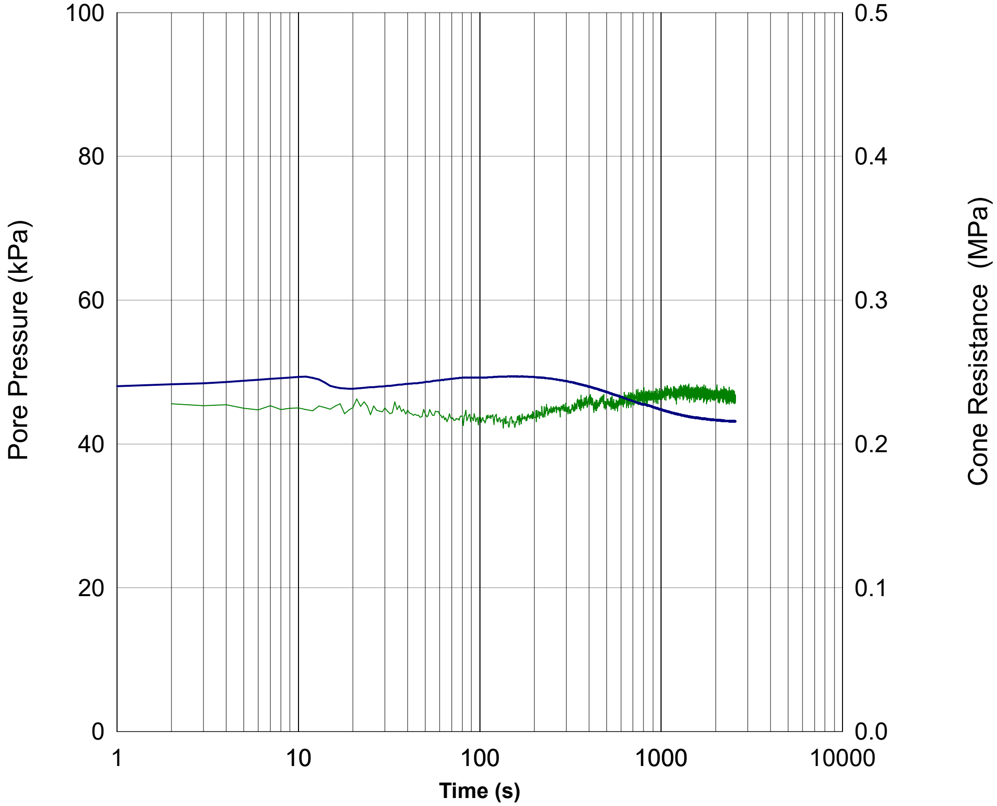
PROJECT No 99751.01

CPT208A

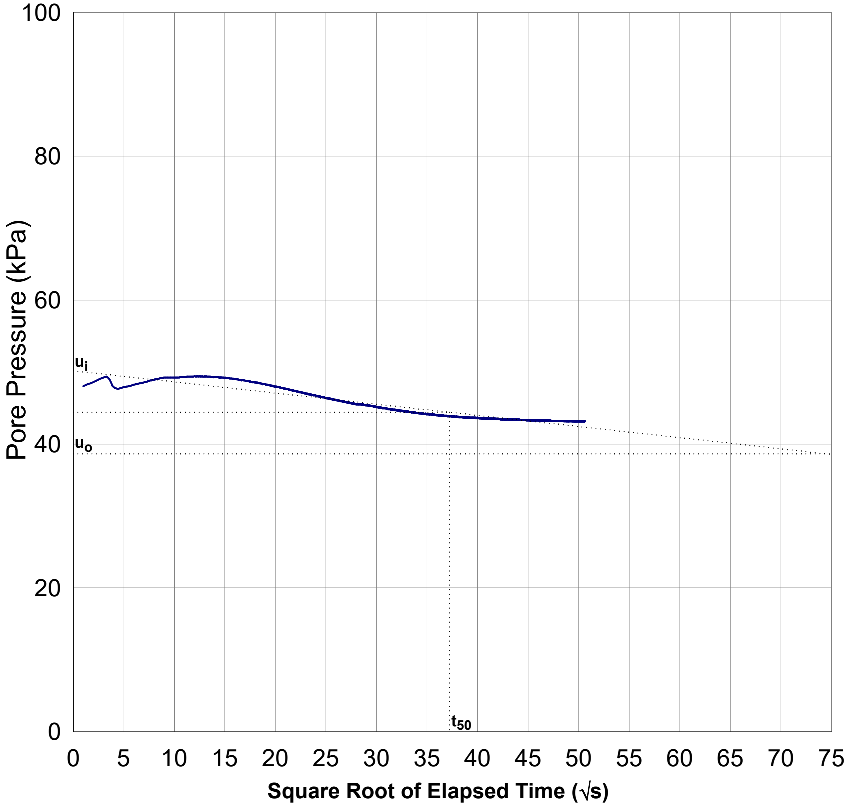
DEPTH 5.84m

DATE 29/07/2020

PORE PRESSURE / CONE RESISTANCE



ROOT-TIME GRAPH



Water Level after test:	1.9	
Estimated hydrostatic pore pressure (u_0):	38.7	**kPa**
Estimated Initial Pore Pressure (u_i):	50.2	**kPa**
Final Measured Pore Pressure:	43.1	**kPa**
Time for 50% pore pressure reduction (t_{50}):	1386	**seconds**
	23.1	**minutes**

c_h:	15	**m²/year**
Location of Filter Element:	2 (behind tip)	
Diameter of Cone:	35.7	**mm**

Reference: 'EVALUATION OF FIELD CPTU DISSIPATION DATA IN OVERCONSOLIDATED FINE-GRAINED SOILS'
J.P. Sully, R.G. Campanella XIII ICSMFE, 1994 New Delhi, India

REMARKS:

File: CPT208A-STITCHED.T03
Cone ID: 200310 **Type:** I-CFXYP20-10

Date
Plotted
Checked

Appendix F

Laboratory Test Results

Material Test Report

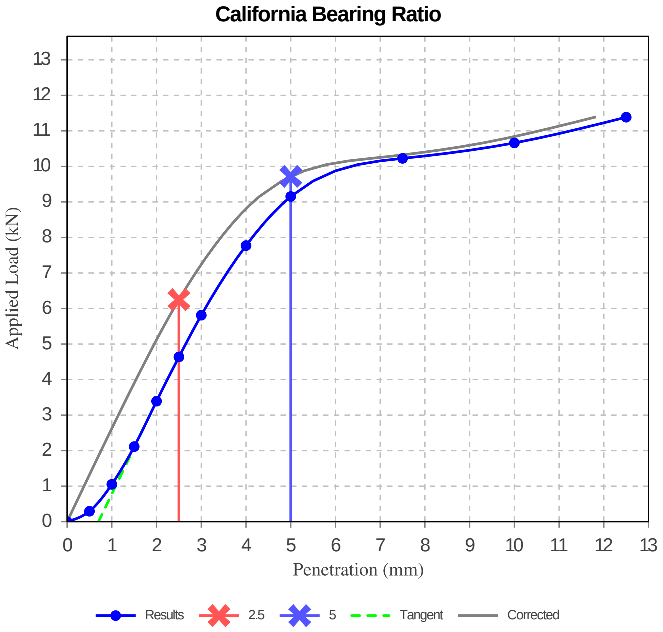
Douglas Partners
Geotechnics / Environment / Groundwater
Douglas Partners Pty Ltd
Sydney Laboratory
96 Hermitage Road West Ryde NSW 2114
Phone: (02) 9809 0666
Fax: (02) 9809 0666
Email: mick.gref@douglaspartners.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Mick Gref
Senior Technician
NATA Accredited Laboratory Number: 828

Report Number: **99751.01-1**
Issue Number: 1
Date Issued: 04/08/2020
Client: SJB Architects
PO Box 1149, SURRY HILLS NSW 2010
Contact: Jonathan Knapp
Project Number: 99751.01
Project Name: Proposed Pool and Park Redevelopment
Project Location: Kogarah War Memorial Pool, Carss Park
Work Request: 6474
Sample Number: SY-6474A
Date Sampled: 22/07/2020
Dates Tested: 27/07/2020 - 03/08/2020
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Sample Location: **BH103 (0.8 - 1.3m)**
Material: FILL/Clayey SAND

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	5 mm		
CBR %	**50**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Visual Assessment		
Maximum Dry Density (t/m^3)	2.03		
Optimum Moisture Content (%)	10.0		
Laboratory Density Ratio (%)	100.0		
Laboratory Moisture Ratio (%)	98.0		
Dry Density after Soaking (t/m^3)	2.03		
Field Moisture Content (%)	7.4		
Moisture Content at Placement (%)	9.8		
Moisture Content Top 30mm (%)	11.9		
Moisture Content Rest of Sample (%)	11.2		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	48.2		
Swell (%)	0.0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0		



Material Test Report

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Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Mick Gref
Senior Technician

NATA Accredited Laboratory Number: 828

Report Number: **99751.01-1**
Issue Number: 1
Date Issued: 04/08/2020
Client: SJB Architects
PO Box 1149, SURRY HILLS NSW 2010
Contact: Jonathan Knapp
Project Number: 99751.01
Project Name: Proposed Pool and Park Redevelopment
Project Location: Kogarah War Memorial Pool, Carss Park
Work Request: 6474
Sample Number: SY-6474B
Date Sampled: 22/07/2020
Dates Tested: 27/07/2020 - 03/08/2020
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Sample Location: **BH105 (0.9-1.4m)**
Material: FILL/SAND

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	2.5 mm		
CBR %	**45**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Visual Assessment		
Maximum Dry Density (t/m^3)	1.77		
Optimum Moisture Content (%)	11.5		
Laboratory Density Ratio (%)	100.0		
Laboratory Moisture Ratio (%)	99.0		
Dry Density after Soaking (t/m^3)	1.76		
Field Moisture Content (%)	6.0		
Moisture Content at Placement (%)	11.2		
Moisture Content Top 30mm (%)	15.1		
Moisture Content Rest of Sample (%)	15.2		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	51.7		
Swell (%)	0.0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0